A

TREATISE,

OR

REFLECTIONS,

Drawn from PRACTICE on

GUN-SHOT Wounds.

Wherein the Nature, Symptoms and Cure
of Gun-Shot Diſorders in general are
explained, whether Contuſions, Wounds,
Fractures, &c. or Complications of theſe;
as alſo, the Wounds from this Cauſe,
of each particular Part, are methodically
treated of, and their Peculiarities in Point
of Cure, fully exhibited.

By HENRY FRANCIS LE DRAN,

Sworn Surgeon at *Paris*, and Senior Maſter of that
Company; Senior Surgeon Major of the Hoſpital
la Charité; of the Royal Academy of Science,
and of the Academy of Surgery; Conſulting Surgeon to his Majeſty's Camps and Armies.

Tranſlated from the French Original.

LONDON:
Printed for JOHN CLARKE under the
Royal Exchange Cornhill, 1743.

Harvard Medical Library
in the Francis A. Countway
Library of Medicine ~ *Boston*

VERITATEM PER MEDICINAM QUÆRAMUS

Gift of
DORCAS L. and RUTH A. WOODBURY

TO MESSIRE

Francis la Peyronie,

Maſter of the Horſe, Counſellor, Chief Surgeon to the King, Chief and Keeper of the Charters and Privileges of Surgery in the Kingdom.

SIR,

ALLOW me to ſhelter this new Performance, which I now preſent the Publick with, under [illegible]

Protection. It is a Reſpect which I owe to the Place you hold, and more eſpecially to that real Merit and Superiority of Talents which has advanced you thither.

The honourable Employment which keeps you at Court, near the ſacred Perſon of our auguſt Monarch, induces you at the ſame Time to have the Good of his Subjects ſincerely at Heart. What earneſt Care did you ſhew during the laſt War, in procuring neceſſary Aſſiſtance and Relief from Surgery, to thoſe brave Warriors who have been prodigal of their Lives in their Sovereign's Cauſe, and thus have maintained the

Glory of *France*, with ſo much diſtinguiſhed Valour!

The Honour you did me, of nominating me conſulting Surgeon to the Army in *Germany*, has laid me under new Obligations. That I might anſwer your Intentions, *Sir*, I have carefully examined the whole Affair of Gun-Shot Wounds. Repeated Experience upon various Occaſions has juſtified the Reflections I had already made, and enabled me to add new ones. Theſe Enquiries are what I now preſume to preſent you with.

Every Writer thinks well of his own Productions: For my own Part, *Sir*, I ſhall approve of mine, only ſo far as it gives you Satisfaction, and exhibits to you *that* Surgery, which you have always practiſed with univerſal Applauſe. I am with the greateſt Reſpect, and ſincere Attachment,

SIR,

Your moſt humble and

moſt obedient Servant,

Le Dran.

ADVERTISEMENT

TO THE

READER.

WHEN I publiſhed my Chirurgical Obſervations, in the Year 1731, I in ſome Meaſure promiſed to add a thrid Volume to the two former; and had not his Majeſty inſtituted an Academy of practical Surgery, I ſhould now fulfil that Engagement. But as I am a Member thereof, whatever Obſervations I become Maſter of, from Time to Time, I owe to that Society, and cannot publiſh them without thoſe of the other Members.

Finding myſelf hereby diſengaged from my Promiſe, I have employed my leiſure Hours in compoſing this Treatiſe of Gun-Shot Wounds. As I was initiated from my Youth into the Management of theſe Diſorders, ſo I have had ſeveral new Opportunities of eſtabliſhing my Reflections by Practice; and I think myſelf bound to make them publick, in Conſideration of the Honour his Majeſty did me in the laſt War, by appointing me conſulting Surgeon to his Armies.

Several Authors have wrote upon this Subject. *Maggius*, *Ambroiſe Paré*, *Manget*, and many others, have treated it with a good deal of Learning; and we may ſay, that they have furniſhed us with ſome excellent Precepts. Therefore, whenever I have found them agree with Experience, and where it was impoſſible to place Things in a better Light, than they have already done, I have quoted them, and thought it my Duty to acknowledge them as my Maſters. I will ſay however, to the Honour of our Profeſſion, that ſince the Days of theſe celebrated Practitioners, Surgery has made ſo great Advances, that we cannot now copy their

Method of Practice indiſcriminately in every Article. For Example, are we to be directed by *Ambroiſe Paré*, when he propoſes Ch. VII. *Medicines that have a great Efficacy in drawing out Bullets and other extraneous Bodies*? Can we adopt his Practice, where he adviſes *in the firſt Dreſſing to introduce long and thick Tents, in order to dilate a Gun-Shot Wound that is too narrow?* What Errors might not the Name of that great Man lead ſuch Readers into, as were not able to diſtinguiſh his good Precepts from thoſe they ought to reject?

I could refer to a great many Places, wherein *Ambroiſe Paré*, *Maggius*, *Manget*, and others have fallen ſhort, in point of good Surgery: But my Intentions are not to criticize upon their Works: And without induſtriouſly appropriating every Thing that is good to myſelf, I freely communicate whatever Reaſon and Experience have taught me.

If no complete Treatiſe has hitherto appeared in the World on Gun-Shot Wounds, it is becauſe theſe are ſo diverſified, that we may venture to ſay, two of them were never found preciſely of the ſame Nature. Notwithſtanding this Variety, it is certain however, that there is ſuch an Analogy between them, that general Rules may be laid down for their Management, which ſhall be applicable to every Caſe that may caſt up; even to ſuch as appear, at firſt ſight, to be of very different Natures.

Theſe Rules ſhould be founded on a Variety of Experience: Therefore it were to be wiſhed we had a particular Account of the greateſt Part of Gun-Shot Wounds, that have hitherto fallen under the Surgeon's Inſpection; eſpecially of the Accidents which they have occaſioned, and the different Methods that have been purſued in their Treatment, whether ſucceſsful, or the contrary. Succeſs, on the one Hand, would aſcertain the fitteſt Method of Cure; and the Want of that, on the other, would point out the Dangers we ought induſtriouſly to ſhun.

To ſupply, in ſome Meaſure, the Place of ſuch Accounts, or, to ſpeak with more Propriety, of ſuch a Collection, which we have never been favoured with, I venture to ſend this Treatiſe into the World. But though it be founded on the different

Methods of Practice which I have obſerved, and the Rules drawn from my own Experience, even in Faults that have eſcaped me; yet I ſhall be aware of recommending it, as perfect. For alas! who can flatter himſelf with attaining Perfection. I promiſe myſelf nevertheleſs, that the Obſervations which may afterwards appear upon this Subject, will not overturn the Practice which I have followed and recommended; but on the contrary ſerve to maintain and eſtabliſh it.

I have divided this Treatiſe into five Parts. In the three firſt, I give a general View of all the different Kinds of Gun-Shot Wounds; and from the various Diſorders that attend them, either in the wounded Parts, or in the whole Œconomy, I deduce general Rules for their Cure, or even for their Prevention. In the fourth, I ſpeak of the Wounds that may happen to every particular Part, which may be different one from another, according to the Structure of each Part; and I apply the Rules there, which I have laid down in the three preceding. The fifth is a Collection of ſome Precepts and Aphoriſms deduced from Practice. And to render them more clear and intelligible to Students of

Surgery, I have annexed a ſhort Explication to each of them.

I know the Reader will find ſeveral Repetitions in this Work: But ſuppoſing this was a Fault in me, yet it ſeemed neceſſary; for as the Order of the Subjects required it, I could not well avoid this Tranſgreſſion. I am inclined to believe, that thoſe, on whoſe Account I write, will not blame me for ſo doing, as they will reap Advantage by it. For in fine, the frequent Repreſentation of the moſt important Points of Inſtruction, is no inconſiderable Benefit.

A
TABLE
OF THE
CONTENTS.

PART I.

Of Gun-Shot Wounds in general. Pag. 1

Of the Accidents which ſeize the whole animal Oeconomy from the Moment of receiving the Wound. 3

Of Numneſs and Weight through the whole Body. 5

Of univerſal Coldneſs. ibid.

Of Syncopes. ibid.

Of Convulſions. 6

Of Change of Colour. ibid.

Of what is obſervable in the Part itſelf, immediately after receiving the Wound. 7
Of Contuſion without a Wound. ibid.
Of the Eſchar. 9
Of Contuſion of the Bone. 11
Of a Wound with a fractured Bone. ibid.
Of the different Kinds of extraneous Bodies. 13
Of the firſt Hæmorrhage. 14
Of the firſt Accidents which appear in the wounded Member. 15
Of the Ecchymoſis. 16
Of the Swelling of the Part. 17
Of the Operations neceſſary to be performed in the different Caſes, whether it be Contuſion or a Wound. 18
The Contuſion is ſlight. 19
The Contuſion is great. 20
Contuſion with Fracture. 21
Contuſion on the Joint, when the Bone has not ſuffered. 22
The Blow hurts the Bone. 23
There is a ſuperficial Wound. ibid.
The Member is ſhot off. 25
The Blow penetrates into the Subſtance of the Member. 26
The Wound is only in the fleſhy Parts. 27
The extraneous Body is loſt in the Wound. 29
The Bone has been ſtruck. 32

Of what muſt be obſerved in making the Inciſions. 37
Of the Method of ſtopping the Hæmorrhages. 39
Of the firſt Dreſſing. 43
Of the Method of preventing or mitigating the Symptoms. 46
Of Regimen. 49
Of Bleeding. 50
Of Vomiting. ibid.
Of Purging. 52
Of the ſubſequent Dreſſings. 53

PART II.

Of the ſecond Claſs of bad Symptoms which may follow in Conſequence of Gun-Shot Wounds. 61
Second Claſs of bad Symptoms in Wounds of fleſhy Parts. 62
Second Claſs of bad Symptoms in Wounds of tendinous Parts. 65
Second Claſs of bad Symptoms, where Bones have been fractured. 67
Of the Reflux of purulent Matter. 69
Of Convulſions. 71
Of the Conſequence of Contuſion of a Bone. 72

Of the ſecond Hæmorrhages. 73
Of certain Evacuations by Stool. 74

PART III.

Of the laſt Claſs of Accidents which may occur in the Courſe of Dreſſing, and in Conſequence of Gun-Shot Wounds. 76
Of the ſubſequent Abſceſſes. 77
Of Want of Sleep. 79
Of the ſubſequent Diarrhæa. 80
Of the Teneſmus. 81
Of the ſubſequent Jaundice. 82
Of the unſheathing of ſome Virus. 83
Of Conſumption. 85
Of Fiſtulæ. 86
Of the Atrophy. 90

PART. IV.

Of Gun-Shot Wounds in particular. 92
Of Wounds on the Head. 93
Of Contuſion on the temporal Muſcle. 94
A Contuſion appearing ſimple, which proves otherwiſe. 95
A Wound on the temporal Muſcle. 96
Reflections deduced from Practice. 97

Of Wounds with Fracture on the Frontal-Sinuſes. 103
Of Wounds with Fracture in the Orbit. 104
Of Wounds with Fracture of the Jaws. 106
Of Wounds in the Tongue. 109
Of Wounds in the Neck. 110
Of Wounds with Fracture of the Clavicle. 113
Of Wounds with Fracture on the Scapula. ibid.
Of Wounds in the Breaſt. 116
Of Wounds in the Lungs. 124
Of Wounds in the Mediaſtinum. 126
Of Wounds in the Heart. 127
Of a Wound in the Diaphragm. ibid.
Of Wounds in the Sternum. 128
Of Wounds with Fracture of the Spine. 131
Of Wounds in the lower Belly. ibid.
Of penetrating Wounds in the Pelvis. 137
Of Wounds on the Oſſa Iliûm. 139
Of Wounds on the Parts of Generation. 141
Of Wounds in the Joints. 142
Of Wounds in the Arm. 145
Of Wounds in the Fore-Arm. 148
Of Wounds in the Wriſt. 151
Of Wounds in the Metacarpus. 152
Of Wounds on the Fingers. 154
Of Wounds on the Thigh. 155
Of Wounds in the Leg. 158

Of Wounds in the Tarſus. 159
Of Wounds in the Metatarſus. 161
Of Wounds in the Toes. 163

PART. V.

Precepts and Aphoriſms deduced from Experience 164
1. *Of the Neceſſity of making Inciſions upon Wounds.* ibid.
2. *How we are to preſerve the Subſtance of the Parts.* 165
3. *Of the Times of dreſſing.* 176
4. *Of the frequent Introduction of a Probe, or Fingers into a Wound.* 170
5. *Of the Clods, or Ropes of Blood which are ſometimes found in Wounds, in the Progreſs of Dreſſing.* 173
6. *Of the Worms which are ſometimes found in Wounds.* 174
7. *Of the Pulſations which the Patient ſometimes feels in the Wound.* 175
8. *Of the Reflux of purulent Matter.* 177
9. *Of the proper Times for performing the Operations.* 178
10. *Reſtleſneſs and Inquietude the Signs of Death.* 180

11. *The inextinguiſhable and burning Drought the Sign of Death.* ibid.

12. *The convulſive and palpitating Pulſe prognoſticates Death.* 182

13. *The Method how young Surgeons may be inſtructed in the Management of Gun-Shot Wounds.* ibid.

The End of the Contents.

BOOKS printed for JOHN CLARKE under the Royal Exchange *Cornhill.*

1. THE Art of Surgery, in which is laid down ſuch a general Idea of the ſame as is founded upon Reaſon, confirmed by Practice, and farther illuſtrated with many ſingular and rare Caſes Medico Chirurgical: In 2 Vols. The ſixth Edition, corrected by *Daniel Turner*, M. D. and all his other Works.

2. A Treatiſe of the Diſeaſes moſt frequent in the *Weſt-Indies*, and herein more particularly of thoſe which occur in *Barbadoes*, by Dr. *Towne*.

3. The Sea-Surgeon, or the *Guinea* Man's Vade-Mecum, in which is laid down the Method of curing ſuch Diſeaſes as uſually happen abroad, eſpecially on the Coaſt of *Guinea*, with the beſt Way of treating Negroes, both in Health and in Sickneſs, by *T. Aubery*, M. D. who reſided many Years on the Coaſt of *Guinea*.

4. The Nature and Cures of Fluxes, to which is added the Method of finding the Doſes of purging and vomiting Medicines for every Age and Conſtitution of Men, together with the Doſes of theſe Medicines in common Uſe: The third Edition, by *W. Cockburn*, M. D.

5. The Anatomy of human Body abridged, or a ſhort and full View of all the Parts of the Body, together with their Uſes drawn from their Compoſitions and Structures, the eleventh Edition, by *James Keill*, M. D.

6. A Compleat Treatiſe of the Gravel and Stone wherein all their Symptoms, Cauſes and Cures are mechanically accounted for: The third Edition, by *Nicholas Robinſon*, M. D.

A
TREATISE
OR
REFLECTIONS,
Drawn from PRACTICE on Gun-Shot Wounds.

PART I.

Of Gun-Shot Wounds in general.

WE commonly call that a Gun-Shot Wound, which is made by any Body diſcharged from Fire-Arms.

Such Wounds require the Surgeon's greateſt Attention, becauſe they are all complicated, and the Bullet, or whatever Body it is, thrown by Gun-powder; acquires ſuch a rapid Force, that the whole animal Machine participates more or leſs in the Shock and Agitation which is communicated to the Part, the Moment it is ſtruck. The Accidents that ſpring from this Cauſe, though for the moſt Part they appear to be no more than momentary, ſometimes however occaſion others, which ariſe not till afterwards in the Progreſs of Cure. So that the Accidents that happen in the Cure of ſuch Wounds, may be diſtinguiſhed into three Claſſes. Some of them appear at the very Inſtant of the Stroke, or within twenty four Hours. Others come not on till ſome Days after, and are always in the firſt Fortnight. Others again happen after a certain Period of Time. All theſe ſhow themſelves in the whole Habit of the Body, at the Part directly wounded, and over the whole Member.

When I ſpeak of theſe Accidents, I would not be thought to ſay that they neceſſarily happen always; for we often obſerve the Wounds heal very kindly, which may be owing to a ſtronger or weaker Habit, a greater or leſs Diſpoſition in the Fluids towards Inflammation, or to the Nature of the wounded Part, beſides many other Circumſtances. I only ſay that ſuch Accidents may and often do happen, ſometimes one, ſometimes another, and frequently a great Number of them together.

Of the Accidents which ſeize the whole animal Œconomy from the Moment of receiving the Wound.

HEALTH is ſo great a Bleſſing, that we are never deprived of it without Regret. From this Principle, which Nature has ſet up in all Mankind, it is, that ſo ſoon as one feels himſelf wounded by Fire-Arms, he is ſtruck with a panick Oppreſſion too violent to be ſmothered. In that firſt Moment his Reaſon gazes on nothing but Danger, and ſometimes on that Account there follows a ſudden Depravation or total Suſpenſion in many of Nature's Operations. Beſides, it is ſcarcely poſſible that a ſolid Body driven by Gun-Powder, ſhould ſtrike any Part, without communicating at the ſame Time an Agitation proportionable to it's Quantity of Matter, to it's Velocity and to the Reſiſtance of that Part.

This Agitation is technically named *Commotion*; it happens always in the wounded Member, and we learn from daily Experience that it is often communicated to the whole Machine. Whereby the nervous Syſtem is galled and irritated, and then thrown into Strictures or tonick Convulſions, the Source of many diſmal Conſequences.

Thus ſome wounded Perſons feel a general Numneſs and Weight; others are ſeized with frequent *Syncopes*; one falls into convulſive Motions, ſuch as Hiccup, Vomiting, irregular Shiverings, or tonick Stiffneſs in the whole Body; while another becomes yellow, green, or leaden coloured, *&c.*

It is well known that all Parts of our Body, are connected by Means of a reticular Subſtance. This is a Kind of Net-Work that ſerves as a Canvas, if I may be allowed the Expreſſion, in which all our Veſſels are interwoven: Notwithſtanding which in a natural State theſe Veſſels are free enough, provided the Circulation of their Fluids be undiſturbed. But when Strictures come on, that is, when the Maſhes of this Net-Work are drawn together by a ſpaſmodick Convulſion, the Veſſels that creep among them are thereby conſtringed, as if ſurrounded with a Ligature. The Nerves are no more exempted here than the Blood-Veſſels, and hence the Stream of animal Spirits becomes partly intercepted, or entirely ſuſpended.

Of Numneſs and Weight through the whole Body.

The Numneſs and Weight felt through the whole Body is almoſt a neceſſary Conſequence of this Doctrine, if the Stream of animal Spirits is allowed to be the Cauſe of Senſibility and Motion; and therefore ſuch Accidents will be proportionable to the Degree of the *Commotion*. As the nervous Syſtem is under a greater Irritation when the wounded Part is tendinous, than when fleſhy, ſo the Numneſs and Weight will likewiſe be more conſiderable.

Of univerſal Coldneſs.

The univerſal Coldneſs which the Wounded ſometimes complain of even in a warm Seaſon, without any external Cauſe, proceeds in the ſame Manner from the Interception of the Fluids and Spirits in their Circulation, which ceaſe now to move on with Freedom; for natural Warmth depends partly on the progreſſive Motion of our Fluids. This Coldneſs may likewiſe be occaſioned by Loſs of Blood, if any conſiderable Hæmorrhage has happened.

Of Syncopes.

The *Syncopes* may be occaſioned by three different Cauſes. 1. A Suſpenſion of Motion in the nervous Fluid, which is commonly the Effect of Fear. 2. The Irregularity of it's Motion, which may bring on a ſpaſmodick Convulſion in the Fibres of the Heart, whence this will be diſturbed or ſtopt in it's Action for a few Moments. 3. A Diſſipation or Loſs of that Fluid, if a Hæmorrhage has preceded.

Of Convulſions.

The Hiccup, when it is not owing to ſome wounded Viſcus, the convulſive Shiverings, Vomiting, convulſive Motions of the Limbs, or general Stiffneſs in the Body, are all Accidents that ſpring from an irritated nervous Syſtem. It is confeſſed, that the Regularity of our voluntary or mechanical Motions, depends on the free and regular Courſe of animal Spirits; no Wonder then if an irritated nervous Syſtem determines their Stream more towards one Part than another, or even drives them on with ſome Degree of Confuſion.

Of Change of Colour.

When the Patient turns yellow, green, or leaden coloured in a ſhort Time after being wounded, it is undoubtedly owing to this, that the Shock or Commotion has ſtopt the due Secretion of Bile, or perhaps of ſome other Liquor. And that excrementitious Fluid not being ſo freely ſeparated from the whole Maſs as formerly, is accumulated; and at laſt tranſuding through the Sides of ſmall Veſſels, communicates it's Hue to every Part.

Of what is obſervable in the Part itſelf, immediately after receiving the Wound.

ALL the Diſorder which can be produced in any Part by Fire-Arms, may be comprehended in two Particulars, *viz.* a ſimple or complicated Contuſion, and a Wound which is always attended with Eſchars. But then the Wound may be complicated with a Contuſion or Fracture of the Bone, with the Lodgment of ſome extraneous Body, or with a Hæmorrhage.

Of Contuſion without a Wound.

A hard Body, even when thrown with all the Force of Gun-Powder, may ſtrike any Part, and only bruiſe that Part, without making a Wound. This happens when that Body has been thrown from a great Diſtance, and being near the End of it's Courſe, has it's Force greatly diminiſhed. But whether it ſtrikes in an oblique or ſtreight Direction, it always occaſions a more or leſs ſuperficial Contuſion.

By Contuſion is meant a Preſſure upon a great Number of Veſſels, whereby ſome of them are deprived in Part of their natural Spring, others loſe it altogether, and others again ſuffer a Rupture under the Skin; while the Skin itſelf is not deſtroyed. Thus, in every Contuſion there is an Extravaſation of Blood from the ruptured Veſſels; and that Blood is either poured out, forming a Clod in one or more Spaces, which it makes for it's own Lodgment at the bruiſed Part, or it ouzes into the cellular Subſtance round the Circumference. Such Infiltration of the Blood is named *Ecchymoſis*; of which we are to ſpeak afterwards. As the Veſſels under the Skin are broken, there is a Solution of Continuity; and therefore in ſpeaking of Gun-Shot Wounds, I include all Sorts of Contuſion occaſioned by Fire Arms (*a*).

Whatever be the Nature of a contuſed Part, the Effect of the Blow is nearly the ſame; that is, the Veſſels are there ſtretched or broke, and the Fluids extravaſated. But then we are not to look upon all Contuſions in one Light; for tendinous Parts, Cartilages and Bones are, from their natural Structure, more ſuſceptible of bad Accidents when bruiſed, than what are called the fleſhy Parts. Theſe laſt are of a lax Texture, and the Fluids extravaſated among them are ſoon diſſipated by Tranſpiration, after which the Veſſels re-

---

(*a*) Ambr. Paré. Lib. 1. Ch. 1.

turn gradually to their former Spring and Elaſticity. The denſe Texture of tendinous Parts, ſuch as Ligaments, Sheaths, *Aponeuroſes*, *&c.* do not ſo eaſily allow the extravaſated Fluids to be diſcuſſed, and thereby gives them Occaſion to change their Nature; which Change neceſſarily brings on Inflammation and frequently Mortification of the *Aponeuroſis.* Cartilages and Bones are ſtill of a more denſe Texture. Let us ſuppoſe then, what is very poſſible, that a Rupture and *Ecchymoſis* happens to the inveſting Membrane of the bony Cells: In this Caſe, a Diſcuſſion being extremely difficult, the Cartilage or Bone may be affected in ſome Degree. Beſides, a cartilaginous or bony Subſtance does not eaſily re-aſſume it's former Spring after that has been deſtroyed by a ſtretching of it's Fibres. And as the ſoft Parts under the Skin ſuffer Laceration in a Contuſion without a Wound, ſo a Contuſion and Fracture of a Bone may be produced at the ſame Time.

Of the Eſchar.

If the hard Body which is thrown by Gun-Powder be poſſeſſed of it's full Force, it always makes a Wound, whether it only touches the Surface of any Member in it's Progreſſion, or if it ſtrikes in a direct Line. In this Caſe the Violence with which it is carried makes a more or leſs deep Eſchar along the whole Extent of the Wound. This Eſchar is of a black Colour, but is not a Burn as many have fancied, though made by Fire-Arms. We have Reaſon to believe that in the Days of *Ambroſe Paré*, the Blackneſs of the Eſchar was attributed to the Heat of the Bullet or of any other Body thrown by Gun-Powder, becauſe this Author endeavours to overturn that Opinion in more Places than one, and even with more Pains than the Subject deſerves.

By Eſchar is meant a Portion of Fleſh beaten and cruſhed by a hard bruiſing Stroke, which lines all the Inſide of the Wound, and preſerves no Circulation or Commerce with the circumambient ſoft Parts. This Eſchar, be it deep or ſuperficial, adheres to thoſe ſurrounding fleſhy Parts; and ſome Days are required for it's Separation, which is effected by Means of the nutritious Juices that run out from innumerable minute Veſſels, and gradually at Length ſeparate the dead from the living Part.

While the Eſchar keeps adhering, it obturates the Mouths of all the Veſſels in contact with it, and thereby ſtops the Circulation and brings on a Kind of Inflammation at the Circumference of the Wound (*a*).

Of Contuſion of the Bone.

A Bone may be contuſed or even fractured without any Wound in the fleſhy Parts, as we formerly obſerved; and much more may it be ſo when theſe are wounded.

Though the Contuſion of a Bone ſeems to be a Matter of no great Conſequence, yet it is not always really ſo. For Experience has ſometimes demonſtrated, that the Agitation of the conſtituent Parts of a Bone has been communicated to the Marrow, to it's inveſting Membrane, and to that which lines the bony Cells; for ſome Time after theſe Membranes have ſuppurated, and produced a Collection of Matter in the Subſtance of the Bone, as we ſhall have Occaſion to ſee in the ſecond Part.

Of a Wound with a fractured Bone.

A fractured Bone would of itſelf be leſs dangerous than a contuſed one, provided it could be confined, and was not accompanied with a Laceration of the Membrane that lines the internal Cavities, as well as of the *Perioſteum* and all Portions of Muſcles that are inſerted into or ariſe from the broken Part. Fractures

(*a*) Ambr. Paré, Ch. 2.

of this Kind are very ſeldom found ſmooth or level; and ſuppoſing the Bone to be broke quite through, or only in Part, the Splinters that adhere to the Body of the Bone by ſome muſcular or membranous Connexions loſe the Equality of Surface; and hence there neceſſarily follows a Laceration of the ſoft Parts, which ſometimes reaches much farther than the Eſchar.

Notwithſtanding ſuch Laceration, the Pain which a Perſon feels in the Time of receiving a Gun-Shot Wound, even ſuppoſing the Wound to be very large, as when a Thigh is quite carried off, the Pain, I ſay, in this Caſe is not very conſiderable; but commonly the Patient complains only of a weighty Uneaſineſs in the whole Member, as if ſome large weighty Body had fallen on it, or as if ſomething very bulky had ſtruck him, without making a Wound. But in a little Time, or in a few Hours after, the Pain grows ſharp and increaſes according to the Nature of the wounded Part. Wounds of tendinous Parts become exquiſitely painful, while thoſe of fleſhy Parts are naturally leſs ſuſceptible of it. The firſt Sort for that Reaſon are much oftener followed with ugly Accidents. For Pain cauſes a trembling or convulſive Motion, of a greater or leſs Degree, in all the wounded Member;

which, if it continues long, diſturbs the Circulation, and brings on a Surcharge of Fluids. We learn from Experience, that Inflammation and Gangrene are frequently the Conſequences of violent Pain in any Part. Beſides, Pain exaſperates the Blood, throws the animal Spirits into Diſorder, and exhauſts the Patient's Strength, by occaſioning a great Expence of theſe Spirits.

Of the different Kinds of extraneous Bodies.

If the Bullet which makes a Wound paſſes not quite through the Member, it muſt neceſſarily remain either in the Fleſh, or among the Pieces of a Bone when one is broken. It's Stay there may produce more or leſs Miſchief, according as it's Matter and Form is: The Matter may be of ſome Metal diſpoſed to gather Verdigreaſe, ſuch as Braſs, and the Form may be irregular in various Degrees; for a leaden Bullet always undergoes a Change of Figure when it touches a Bone, ſometimes it is cut into two, and ſometimes greatly flattened or ſqueezed into an angular Form; and then it's Inequalities exaſperate the neighbouring Parts whereby it is ſo locked in, that it's Extraction is rendered very difficult.

The Bullet is not the only extraneous Body that is to be found in the Wound; for if it has pierced through and carried away a Piece of the Garment, that Piece of Stuff is puſhed before it; ſo that we meet with Woollen or Linen Rags, *&c.* in Wounds every Day. Even when the Bullet is gone, having run quite through the Member, one is almoſt ſure to find the Stuff that came in with it, eſpecially if the Bone be fractured. It were to be wiſhed that one could lay down certain Rules for determining the Place where ſuch Pieces of Cloth, *&c.* lurk; we can only ſay in general that they are blended with the Eſchar, and when a Bone is fractured probably they are entangled among it's Inequalities. Beſides theſe, many other Kinds of extraneous Subſtances are to be found in Gun-Shot Wounds, Buttons of the Patient's Clothes, Pieces of Money or other Things which were in his Pocket, Splinters which may have been ſeparated and carried to ſome Diſtance from the Bone to which they belonged; and whereever ſuch Bodies run, either from their Inequalities or Hardneſs, they make a Laceration and Eſchar along the whole Tract.

Of the firſt Hæmorrhage.

The Havock we have been ſpeaking of cannot happen in any Part without a Deſtruction of all the Blood Veſſels that were in the Way, whether they be ſmall, large, or of a middle Size. If they were we may conclude from what has been ſaid of the Contuſion and Eſchar that the Wound will not bleed. But if the extraneous Body has opened any conſiderable Veſſel, the Eſchar will not be able to oppoſe the Impulſe of the arterial Blood. It is therefore erroneous to think that no Gun-Shot Wound bleeds; for we often ſee many of the wounded loſe a great Quantity of Blood, and even for Want of Aſſiſtance ſink under a fatal Hæmorrhage. Beſides it may ſo happen, that a middle ſized Veſſel being opened and it's Sides preſſed together by the Eſchar, the Hæmorrhage ſhall not appear till ſome Hours after, when the Fever advances and accelerates the Motion of all the Fluids. When the Hæmorrhage is moderate, it may be uſeful in preventing many ill Accidents; but when large, it kills the Patient or reduces him to the Verge of Deſtruction.

Hæmorrhages may likewiſe come on afterwards in the Progreſs of Cure; but of theſe we ſhall ſpeak in their proper Place.

Of the firſt Accidents which appear in the wounded Member.

THESE Accidents are *Ecchymyſis*, Tenſion, Swelling and Mortification. We

Of the Ecchymoſis. We have already ſeen hard Parts broken, and ſoft Parts lacerated and contuſed; we have ſeen extraneous Bodies brought in and as it were incruſtated in the Subſtance of the Part, the Circulation impeded by the Stricture of the reticular Subſtance, and by the tonick Convulſion of nervous Parts. What Cauſes at once conſpire to produce that *Ecchymoſis* which frequently drowns the whole Member, and that hideous Swelling which may work it's total Deſtruction, if not prevented! In the Moment of the Blow, the foreign Body drives the Blood of the ruptured Veſſels into the Interſtices of thoſe which eſcape; the Eſchar ſuſpends and ſtops the Circulation of Fluids in all the Veſſels which terminate there, and a ſtrong and quick Conſtriction of the reticular Subſtance coming on, ſhuts up all the ſmall Veſſels: Thus many of them burſt from Turgency, the Blood ſpreads more and more through the Interſtices of the Fibres, and there forms in different Places a Number of Clods, as we have ſaid of thoſe which are formed in a Contuſion where there is no Wound. This Extravaſation, called *Ecchymoſis*, reaches ſometimes very far under the Skin betwixt the Muſcles, and even in their fleſhy Bodies. While it remains, 'tis a ſecond Obſtacle to the Fluids in circulating freely through the ſound Veſſels that are compreſſed by it.

Of the Swelling of the Part.

This is what occaſions in the wounded Member the Swelling which almoſt always comes on in a few Hours after; a Swelling that is more or leſs conſiderable, and always more dangerous when above than when below the Wound. Tis natural for the Member to ſwell below, becauſe the Return of it's Fluid is checked; but that Reaſon holds not with Regard to the Swelling above, and whenever it happens, we are ſure ſome tendinous Part has ſuffered, in which Caſe the Inflammation may ſhow itſelf round the whole, that is, above as well as below the Wound.

Suppoſing that a Stricture of the nervous Syſtem occaſions a Numneſs and Weight in the Part, as we have ſeen it ſometimes cauſe theſe over the whole Body, if that Symptom goes not off ſoon, it always prognoſticates other ſtill more diſmal ones; and if the Help which Art points out be not ſpeedily uſed, the Swelling very often riſes to ſuch Degree, that the cloſe Texture of the Skin will not permit a Dilatation, proportionable to the acquired Bulk of the Parts it covers. Then theſe Parts may mortify for Want of Circulation,

culation, even before the Skin becomes diſcoloured.

All theſe Accidents may in a little Time determine the Loſs of a Limb, or even of the Patient's Life. The Surgeon ſhould therefore labour in good Time to remedy or prevent them. It were even to be wiſhed that he was called in the Moment after any Perſon is wounded; for ſuppoſing a Cure be poſſible with proper Helps, theſe may become ineffectual if they are not ſoon enough put in Execution.

Of the Operations neceſſary to be performed in the different Caſes, whether it be Contuſion or a Wound.

THE Suſpenſion of Circulation in the Fluids, and the Collection of extravaſated Blood in the cellular Subſtance of the Part, threaten Swelling, Inflammation and Gangrene, as we have already ſeen; the Splinters of Bones, if any are broken, prick and irritate the nervous Syſtem; extraneous Bodies if any be introduced, fatigue Nature with their Weight and Inequalities; the blood ſtreams from ſome Veſſels in ſuch Quantity as to deſerve the Surgeon's Attention, or at leaſt, conſidering the Situation of the Wound, a Hæmorrhage is to be dreaded.

The Indications of Cure are to be deduced from all theſe Particulars, in Order to determine the proper Manner in which the Surgeon ought to conduct himſelf. If he delays, or if the Swelling advances, he will find great Difficulty in doing what is neceſſary.

There are four Indications to be fulfilled, in Order to perform a Cure. The firſt is to change the Figure, and as much as poſſible, the Nature of the Wound by proper Inciſions (*a*), making a bleeding Wound of that which was a contuſed one. The ſecond is to remove extraneous Bodies. The third is to ſtop the Hæmorrhage. The fourth is to prevent the Accidents which may ariſe, and to remedy thoſe which already appear. This is what we propoſe to explain in particular; and that it may be done with Order, we will go on in the ſame Method which we have hitherto followed,

The Contuſion is ſlight.

If the Contuſion be ſuperficial, if it reaches no farther than the *Adipoſe* Membrane, and there be no conſiderable Clod formed in ſome Cell, it differs in nothing from a Contuſion that is produced by any other Cauſe than Fire-Arms. The uſe of topical Reſolvents, ſuch as Spirit

---

(*a*) Ambr. Paré, Ch. 3.

of Wine with *Sal Armoniac*, Balſam of *Peru*, *&c.* will, by the active and penetrating Parts of ſuch Medicines, facilitate the Reſolution of the extravaſated Fluids: Which is known to be advanced by the Colour of the Part, the Skin becoming then yellow.

The Contuſion is great.

But the Contuſion and *Ecchymoſis*, for theſe cannot be ſeparated, may be deep. One cannot always form a Judgment of this by the Eye, but by the Degree of Pain, the Swelling of the Member, it's Weight, the Loſs of it's Motions, and by Reflections that may be made on the Nature of the Blow, calculating the Softneſs and Mobility of the Part ſtruck which was obſequious to the Stroke, or gave Way with Difficulty; and in examining the Figure, Bulk and Weight of the wounding Inſtrument, which ſuppoſes that Care has been taken to pick it up. In this Kind of Contuſion, Experience ſhows that there is not only an Infiltration, but likewiſe an Effuſion in various Places of the contuſed Part; ſo that it would be wrong to attempt it's Diſcuſſion. The Spring of too many Parts has been deſtroyed to expect it will be reſtored to them again ſo ſoon: And beſides, the Infiltration as well as Effuſion is too deep ſeated. Theſe Fluids are heated up, and fermenting in their Confinement bring on a Suppuration; wherefore that muſt be prevented by making Inciſions and Scarifications, deeper or more ſuperficial according to the Depth of the Contuſion and *Ecchymoſis*.

Contuſion with Fracture.

If by Chance the Blow has been violent enough to fracture a Bone without making a Wound (for ſometimes we have ſeen very firm Bones, the *Tibia* or *Femur* for Inſtance broken by a Cannon Bullet, while the Skin and even the Garment itſelf has not been torn) the Inciſions ſhould not lay the Fracture expoſed, but only dip into the Bodies of the Muſcles and among their Interſtices. Theſe Wounds are to be dreſſed afterwards according to Art; and if there is one or more fractured Bones, they muſt be ſet, and kept in that right Situation, by the Help of a proper Bandage and ſuitable Poſture.

The Benefit that ariſes in theſe two Caſes from the Inciſions I have propoſed, (conſidering that Inciſions cannot be made without occaſioning the Wound to bleed freely,) is, that we thereby not only empty a Number of little ſurcharged Veſſels, which would have evacuated themſelves one after another, but alſo give free Diſcharge to Part of the extravaſated Fluid; this is the true and ſureſt Method of preventing the Swelling which threatens the Member.

Contuſion on the Joint when the Bone has not ſuffered.

If the Contuſion, which I always ſuppoſe to be violent, be upon a Joint, it may reach thoſe Parts that immediately incloſe the Articulation, ſuch are *Aponeuroſes* and the capſular Ligament. Theſe Parts claim our Regard, and eſpecially the *Capſula*, which cannot be opened without expoſing the Articulation, and the Inciſions ſhould never penetrate into them, but only into their ſurrounding *Adipoſe* Membrane. I know theſe Parts will be liable to inflame, if the nutritious Juice extravaſated in their Subſtance ſhould change it's Quality. I know alſo that in Conſequence thereof, they may ſuppurate and be deſtroyed; but ſtill it is unwarrantable to cut them, except when the Fluctuation of an effuſed Fluid is perceivable under them: When ſuch Fluctuation is not ſenſible, we muſt endeavour to prevent theſe Accidents, or correct them by an exact Regimen, copious and repeated Bleedings, and by the Application of topical Emollients and Reſolvents, either in the Way of Fomentations or Cataplaſms often renewed. Be-

The Blow hurts the Bone.

Beſides Contuſion of the tendinous Parts, if the Bones that form the Articulation be bruiſed, fractured or luxated, there remains no Hope of ſaving the Member. 'Tis true indeed, that in ſome Inſtances of this Kind, it has been preſerved; but 'tis alſo true, that a much greater Number of ſuch Patients have been loſt than ſaved. Their Death can be attributed to nothing but to the Inflammation of Ligaments, *Aponeuroſes*, or ſynovial Fat and Glands; in Fine, to their Suppuration which drowns the whole Articulation; Accidents that are moſt commonly attended with a Reflux of purulent Matter. If ſo, 'tis better to prevent that by amputating the Member, than to wait it's Arrival.

There is a ſuperficial Wound.

A ſolid Body ſhot from Fire-Arms, may, as it goes along, ſtrike a Part and make a Wound only at the Surface. Then it may carry the Piece quite off, and ſo form a ſmooth Wound, or it may leave a hanging Flap; and this will depend on the round or irregular Figure of that Body, which may be either a Bullet, a Bomb or Grenade Shell, or a Stone, *&c.* In both theſe Kinds of Wounds, there is an Eſchar more or leſs deep; and though that foreign Body ſtruck the Surface only, it may occaſion an *Ecchymoſis*, a Commotion, and even a Fracture of ſome neighbouring Bone, without laying it bare. *Read my Obſervations Vol. II. Obſerv. communicated by Mr.* Leauté. The *Ecchymoſis* and Commotion may require that the Surgeon make the Inciſions and Scarifications of which we have ſpoken; but with Regard to the Eſchar, if it is not totally removed it muſt be ſcarified in it's whole Extent in Order to advance it's Separation afterwards, by the Application of proper Medicines.

If there be a conſiderable Flap, we muſt after ſcarifying or entirely removing the Eſchar, replace and keep down that Flap, either by a ſuitable Bandage or by the dry Suture, or even with the interrupted Stitch, to ſpare Nature the half of her Work and to forward a Cure, that would be infinitely more tedious if it was cut off. Theſe Precautions may have the deſired Effect, I mean if no Inflammation comes on, the Flap may grow too again, wherever there is no Eſchar; but if a Swelling riſes they become uſeleſs, for the Wound will ſuppurate; and if the dry or interrupted Suture has been made, it muſt now be only contentive. For which Reaſon in making the Suture the Threads ſhould be ſo tied, that they may be looſened in Caſe of Neceſſity.

The Member is ſhot off.

The wounding Body may ſtrike in a perpendicular Direction. If it has Bulk and Velocity enough to take away Part of a Limb, the Wound is never uniform, the Bone is never broke ſmooth, and, beſides the Splinters which may reach much higher than the Blow, the Bone may be ſplit up a certain Length. Farther, the Shock may be communicated to the Articulation above, and it certainly is ſo communicated if the Wound be near that Articulation; thus it's *Capſula* and Ligaments are injured. As a Proof of this, let it ſuffice to ſay, that we have ſometimes ſeen that Joint diſlocated by the ſame Blow, which took away the lower Part of the Member. When there is no Luxation the *Capſula* and Ligaments have reſiſted, which they could not do without ſuffering a violent Extenſion. The Amputation ſhould undoubtedly be made above the Wound: But can we expect a laudable Suppuration here, where the whole nervous Syſtem is in a Kind of Convulſion, and where the *Ecchymoſis* reaches to the Joint? No certainly; becauſe the Stump muſt ſoon ſwell for the preceding Reaſons. The Limb therefore muſt be amputated above the Joint, which is higher than the Wound. If Patients have frequently been obſerved to die ſome Days after the Operation, 'tis becauſe it was performed immediately above the Wound, and below the upper Articulation; and becauſe that Joint has afterwards ſwelled, and been ſeized with an Inflammation, and the Fever has riſen, in Conſequence whereof the Suppuration has been ſtopt, the Source of many other Miſchiefs.

The ſole Refuge now, was to have made a ſecond Amputation above the ſuperior Joint as ſoon as it began to ſwell: And thoſe who have had Boldneſs enough to do it, have commonly ſeen Patients recover, who without this Aſſiſtance, in all Appearance, would have periſhed.

The Blow penetrates into the Subſtance of the Member.

If the ſolid Body which wounds, has not ſufficient Bulk or Weight to take off a Member, it pierces it through and through, or remains lodged in it.

If it paſſes through and through, the Entrance may be diſtinguiſhed from the Paſſage outwards, by three Circumſtances, either taken together or ſingly. 1. The Skin is lightly pitted at the Place where the Bullet entered, and raiſed towards the Place whence it went out. 2. The Eſchar, Contuſion, and *Ecchymoſis*, are much more remarkable on the Side of the Entrance. 3. The Paſſage outwards is ordinarily larger than the Entrance. This laſt Article however is not without Exception; for two Bullets may go in together, when the Shot is very near, then ſeparate from each other within the Member, and not run out together: It may likewiſe ſo happen that one goes out while the other lodges in the Part.

The Wound is only in the fleſhy Parts.

In Caſe the Bullet paſſes through and through, and touches only the ſoft Parts, the Wound muſt be enlarged with proper Inciſions, and converted into a long Wound which will be eaſily dreſſed. It were even to be wiſhed that we could ſcarify the Eſchar along the whole Tract of the Bullet, to make it a bleeding Wound. When there is a ſmall Diſtance betwixt the Entrance and Exit; the two Openings muſt be joined into one if poſſible, without dividing any Tendon or conſiderable Blood-Veſſel. By this Means the forementioned Scarifications may be made on the whole Eſchar: Suppoſing this to be impoſſible, we muſt cut both on the Side of the Entrance and Exit, ſo far as the Parts concerned will permit, in ſuch Manner that the whole Path of the Bullet be wide enough to keep always a free Communication between the two Wounds. If this has been neglected, the Sides of the

Diviſion will approach each other by the Swelling which may riſe upon the Part, and the Suppuration will be eſtabliſhed with great Difficulty.

If the Tract be long, as happens when a Bullet perforates any Member obliquely according to it's Length, the two Wounds cannot be joined into one, nor can their Communication be rendered ſo free as we have propoſed; but this Inconvenience may ſometimes be ſupplied by making Counter-openings at ſome Diſtance from each other. 'Tis true indeed, that this does not fulfil the whole Intention; we thereby evacuate ſome of the Fluids, but the Wound cannot be made to bleed freely along it's whole Extent, which is required in Order to procure a complete Evacuation. We may obſerve by the Way, that ſuch Wounds of Parts that are very fleſhy, as in the Thigh for Inſtance, are ſeldom cured from the Difficulty there is in managing the long Path, according to the Rules of Art; whence it is that commonly ſome ugly Accidents caſt up and carry off the Patient. Might not a Seton introduced into the Wound betwixt the two Orifices prevent theſe? No, ſurely; this would be an extraneous Body which would haraſs the Parts, either by it's lodging there, or by it's Friction when it was drawn along and changed. If the Swelling is over, a Seton may be uſeful a few Days to conduct proper Medicines into all the Wound, but it muſt be taken out again when the Wound is cleanſed.

The extraneous Body is loſt in the Wound.

If the extraneous Body be lodged in the Subſtance of the Member, we muſt examine nicely to know where it is, that if poſſible it may be removed; becauſe it's Extraction is both neceſſary and affords great Comfort to the Patient, which will be advantageous in forwarding the Cure.

The Direction of the Blow will nearly indicate the Place where the extraneous Body lodges, and the Surgeon may ſoon find out that by introducing a large Sound, not a ſmall Probe, which from it's Bulk will neither make new Paſſages, nor be ſtopt by little Obſtacles (*a*). This is only, I ſay again, to form a better Judgment about the Direction of the Blow, and conſequently of the Place where the Bullet probably lurks. We may add however, that this Direction is not always a ſure Method of diſcovering the Bullet, for the Reſiſtance of ſome Bone which it has rubbed againſt in it's Paſſage, may have thrown it out from the ſtreight Line which it would have naturally followed. The

---

(*a*) Ambr. Paré, Ch. 5.

Firmneſs of the Skin which the Bullet could ſcarcely overcome in going outwards, may do the ſame; and we have ſometimes obſerved the Bullet, carrying a Piece of Buff-Skin or Cloth before it, plunge into the Limb, but not being able to pierce the Skin of the oppoſite Side, it has dug out a Paſſage half Way round the Limb in the *Adipoſe* Membrane.

The Direction of the Shot being found out as near as poſſible, the external Wound muſt be dilated, and then a Finger introduced. The Finger, which by the Delicacy of it's Touch is able to diſtinguiſh the cruſhed from the ſound Fleſh, is the beſt Probe we can uſe (*a*). It ſerves to conduct the Biſtory, and if nothing forbids, to dilate as far as the Bottom of the Wound, even upon the Bullet itſelf, which otherwiſe could not eaſily be laid hold of; becauſe, as we have formerly obſerved, it is cloſe ſet in the Fleſh. In Wounds of the ſmall Extremities, ſuch as the Fingers, and in thoſe of the Hand, or any Part that is not large enough to allow a Finger's being introduced, the Sound muſt be uſed to conduct the Biſtory. If the Wound be ſufficiently dilated we can eaſily remove extraneous Bodies, either with the Fingers, Forceps, or Scoop.

(*a*) Ambr. Paré, Ch. 3.

When the Bullet has run through the Subſtance of any Limb, it ſometimes lodges under the Skin at the Place which is directly oppoſite to the external Orifice; ſo that when we cannot find it in the Wound, we muſt carefully feel the Member all round (*a*). If we diſcover it by this Means, 'tis better to make a Counter-opening for taking it out, than to extract it through it's own Paſſage. A counter-opening is alſo convenient for extracting any Bullet that has paſſed by the Trunk of the Veſſels which nouriſh the Part. If the extraneous Body cannot eaſily be diſcovered, 'tis better to leave it than haraſs the Parts by ſearching too curiouſly. When the Bullet is felt by the Sound, perhaps ſome would propoſe to draw it out with the Bullet-Extractors, which are deſcribed in many Treatiſes of the Inſtruments. But ſuppoſing the Thing poſſible, the Extraction of that Body does not exempt you from making the forementioned Inciſions, and conſequently you ought to begin with them. I cannot therefore approve of uſing theſe Bullet-Extractors, except in a Caſe where the Structure of the Parts will not allow of enlarging the Wound ſufficiently to the Bottom.

(*a*) Ambr. Paré, Ch. 3.

The woollen or linen Rags which were brought in with the Bullet, are not ſo eaſily diſcovered, by Reaſon of their Softneſs, as the Bullet itſelf; frequently they are neſtled in the Interſtices of adjacent Muſcles; and if the Finger cannot diſcover them after proper Inciſions have been made, we muſt not diſtreſs the Parts with too much ſearching; they may come away afterwards with the Suppuration, and this Intention will be greatly promoted by the Inciſions and Counter-openings.

The Bone has been ſtruck.

Let us ſuppoſe now, that the Bullet has met with a Bone in it's Way. That Bone may be laid bare, and bruiſed only. We may judge that the Contuſion is ſlight, if the Bullet has not been reflected; and in this Caſe there will be no bad Conſequences, provided we unbridle the *Perioſteum*, as we do the *Pericranium* when it is contuſed. If this be neglected, the *Perioſteum* may become inflamed over the whole Bone; it may ſuppurate and give Riſe to many troubleſom Symptoms. The Wound may be of tedious Cure from the Exfoliation of the Bone, which, in Spite of all the Aſſiſtance of Art, is ſometimes very ſlow in being accompliſhed. If the Contuſion be very great (which we can know by the Bullet's being much reflected) we muſt unbridle the *Perioſteum* in the ſame Manner; but notwithſtanding this, as we formerly obſerved, the Contuſion of the Bone may occaſion an Extravaſation in it's Subſtance ſome Days after, and thus work it's Deſtruction. If a Bone be fractured or cruſhed in a very hard Part, ſuch as the Middle of the *Tibia*, the Surgeon will perceive it, without any Difficulty. In this Caſe, the Shock, the Tenſion, and even the Swelling which may ariſe, will be proportionable to the Nature of the Fracture. The foreign Body may have cruſhed the Bone quite round, or it may have damaged only a Portion of it's Extent in Thickneſs, either the Fore-part, as the Spine of the *Tibia*, leaving that Part entire which is towards the *Solæus* Muſcle, or the poſterior Part leaving the Spine of the *Tibia* uninjured. Beſides it is poſſible, that a Portion of the Bone which ſeems not to have given Way to the Blow, may be ſeparated from the two Extremities of the Bone, and kept adhering only by the inveſting Membrane of it's internal Surface, by the *Perioſteum*, and by the Muſcles which are attached at that Place; a Circumſtance very difficult to be known. Farther, it may ſo happen that the Bone is fractured at the Part where the Blow was received, and beſides that, there is another Fracture of the ſame Bone at ſome Inches Diſtance from the former Place, as *Maggius* tells us he met with, *Page* 46. Laſt of all, the Bone may be ſplit to one of it's *Epiphyſes*; this is what the Surgeon cannot know with any Certainty during the firſt Days, notwithſtanding the ſtricteſt Examination; but ſome Days after it will be indicated by two Circumſtances. The firſt of theſe is a Redneſs on the Skin, with a moderate Swelling along the whole Fiſſure, ſuch as we obſerve on the Head along a Fiſſure of the Skull: This Redneſs however may require a long Time before it appears, on ſuch Limbs as are very fleſhy. The ſecond Indication of ſuch a Crack in the Bone, is a Beginning of the *Callus*, which is perceivable ſome Days after, on the Termination of the Fiſſure at the fractured Part of the Bone; this *Callus* is formed by the nutritious Juice that is poured out at the Fiſſure, and begins to harden.

In moſt of theſe Caſes, the ſhivered Pieces of the Bone having made a Laceration at the Bottom of the Wound, the Splinters prick and tear the *Perioſteum*, or ſome other tendinous Parts; if any Rags of the Cloths have been introduced with the Ball, they lodge there hooked on the broken Pieces of Bone; the Bullet itſelf may likewiſe remain there, and certainly it is not of a ſmooth Form, becauſe the Bone which it broke muſt have reduced it to an irregular Figure. All theſe Things taken together are ſo many Motives that ſhould determine us to make large Inciſions, ſufficient to prevent the Accidents that threaten the Member, to remove the extraneous Bodies, and to enable us to dreſs that Wound eaſily, which is deep and muſt be kept open a long Time in waiting for the Exfoliation that muſt happen. The Inciſions being made in a proper Manner, we introduce a Finger into the Wound, whereby we can eaſily diſtinguiſh whatever is extraneous. If any Splinters are felt entirely ſeparated from the Body of the Bone, their Attachments muſt be cut, and afterwards they may be taken out with great Eaſe. To pull them out by Force before their Adheſions were divided would be an unwarrantable Practice; becauſe that could not be executed without giving the Patient exquiſite Pain, which would irritate the nervous Syſtem ſtill more. Any large Splinters or ſhivered Pieces of Bone that are not diſplaced, and adhere by a conſiderable deal of Fleſh, muſt be left untouched, becauſe the *Callus* may untie them again: But if their ſharp Points prick the circumambient ſoft Parts, theſe Points or Edges muſt be taken off with a Pair of cutting Forceps.

If the Bullet ſtrikes any large Bone, the *Tibia* for Example, on one of it's *Epiphyſes*, in this Caſe the Bullet may neither ſuffer a Reflexion from it's direct Courſe, nor break the Bone, but dig out a Paſſage for itſelf and remain faſt locked in the Bone. When it does not penetrate deep, and when it can be extracted either with the Fingers, Bullet-Screw, or Googe, we may have Hopes of ſaving the Patient without amputating the Limb, provided there happens none of the remarkable Accidents which we have been treating of, in Conſequence of the Shock which the whole Articulation has ſuffered, or of an Inflammation over all the tendinous Parts that incloſe the Joint. But if the Bullet has penetrated ſo far into the Subſtance of the Bone as to render it's Extraction impracticable, or if the ugly Symptoms begin to appear, we can have Recourſe to nothing but the Amputation of the Limb. If the Bullet has taken away a Piece, or penetrated into the Subſtance of a Bone at it's ſpongy Extremity, the Injury is commonly much more inconſiderable, than if the ſame Thing had happened to the Middle of the Bone; and particularly in this Caſe there are always very few Splinters.

ters. But the Advantage that ſuch a Wound has over one that is inflicted at the Middle of the Bone is ſufficiently compenſated by the Havock, which, in the former Caſe, is made among the ſurrounding *Aponeuroſes* of the Extremity of the Bone, and among the Tendons which are fixed there. The Surgeon's Diſcretion muſt direct his Conduct according to the Exigency of the Caſe; that is, to determine if there is any Hope of ſaving the Limb by making proper Inciſions, and if there are none, to perform the Amputation. While he is endeavouring to ſave the Limb, if the Patient be taken with very ſharp Pain, which is not occaſioned by ſome pointed Pieces of Bone pricking the neighbouring ſoft Parts, 'tis a Demonſtration that the nervous Syſtem has ſuffered greatly; in this Caſe the Amputation muſt not be delayed, otherwiſe convulſive Motions will ſoon appear on the wounded Limb, and ſpread quickly over the whole Body. The Amputation will then prove fruitleſs.

Of what muſt be obſerved in making the Inciſions.

IN making the Inciſions which I have propoſed, and which muſt be deeper or more ſuperficial according to the Exigence of the Circumſtances, we ſhould not ſpare the fleſhy Bodies of Muſcles, and wherever they are covered with a common Membrane or *Aponeuroſes*, as thoſe of the Leg and Fore-Arm are, we muſt unbridle or cut up that Membrane freely, if we would prevent Abſceſſes that muſt otherwiſe unavoidably be formed in the Interſtices of Muſcles. The ſame Rule is to be obſerved with Regard to all *Aponeuroſes* wherever they be; but then they require great Skill and Circumſpection to cut them up in a proper Manner. If they are divided only Lengthways, according to the Direction of their longitudinal Fibres, this Inciſion does not unbridle them enough; they muſt therefore be cut in a tranſverſe Direction, or obliquely, and ſometimes even in all poſſible Directions like the radiated Light of the Sun.

In theſe Inciſions we ought to ſpare the Tendons as much as poſſible, that the Motion of the Limb may be preſerved after the Wound is cured. But in ſome Caſes the Circumſtances may be ſuch, that we cannot avoid cutting them; as for Example, when 'tis neceſſary to make Inciſions on the Foot, and in the Caſe of a Wound with great Havock made among the Bones of the *Tarſus* or *Metatarſus.* Others of the ſame nature may caſt up in Practice, which 'tis hard to foreſee.

The Surgeon's principal Attention however, with regard to Inciſions, ſhould be to keep clear of the large Trunks of Veſſels, leſt the inferior Parts be deprived of their neceſſary Nouriſhment. The ſmaller Veſſels, which are only Branches or Ramifications of theſe Trunks, may be cut without Heſitation; but after they are divided, the bleeding muſt be ſtopt.

Of the Method of ſtopping the Hæmorrhages.

STIPTICKS, Compreſſion, and a Ligature are the common Means uſed in Surgery for ſtaying Hæmorrhages. In the Caſe of a Gun-ſhot Wound, I reject that ſort of Compreſſion which is made by cramming up the Wound with dry Lint, becauſe it would hinder, or retard the Evacuation which we endeavour to procure by our Inciſions, and might produce a dangerous Swelling on the Circumference of the Wound. Stipticks need the Aſſiſtance of Compreſſion; they are efficacious only ſo far as they make an Eſchar, and the Wound itſelf is previouſly too much encumbered with Eſchars: Wherefore I would alſo forbid the Uſe of theſe Applications in every Caſe where a Ligature can be made on the bleeding Veſſel. I prefer the Ligature therefore to any other Method of ſtopping a Hæmorrhage, becauſe it makes a Compreſſion only upon the Veſſel itſelf.

The great Difficulty lyes in ſtitching the Veſſel with Dexterity, when the Wound is deep; and that Difficulty is owing either to the Veſſel being ſo concealed within the Fleſh, that it's Orifice cannot be diſcovered, or to it's deep Situation in the Wound, or to the great Quantity of Blood which fills up the Wound, and thereby covers the Veſſel.

The Depth of it's Situation in the Wound will be no Hindrance, provided ſufficient Inciſions have been made; and the overflowing of Blood will be no longer an Obſtacle, if the Surgeon takes Care to apply a Tourniquet on the upper Part of the Limb. This being done, he muſt clear the Wound of all the Blood which ſtuffed it up, and hid that Part where the opened Veſſel lyes; then he may paſs a Needle under that Veſſel, and make an effectual Ligature.

In Wounds on the Trunk of the Body, or in the Inciſions which we are obliged to make there, 'tis poſſible that ſome Veſſel may bleed ſo freely as to require being taken up with a Ligature; and here the Hæmorrhage cannot be ſuſpended by applying the Tourniquet, as on the Extremities. In this Caſe it is very troubleſome to tie the Veſſel; and yet the Ligature is preferable to the Uſe of Stipticks, as we have already obſerved. In order therefore to make a Ligature here with greater Eaſe, that is, to hinder the ſtreaming Blood from covering the Orifice of the Veſſel, we muſt ſeek out that Orifice with one of our Fingers, and when it is found, the Finger being kept upon the Veſſel will ſtay the Hæmorrhage. Now the Surgeon muſt remove all the Blood which filled up the Cavity of the Wound, then with a crooked Needle paſs a Thread through the Fleſh, at the Circumference of the opened Veſſel, and cauſe an Aſſiſtant tie the Knot, without removing the Finger 'till all this be done. But if the Ligature be impracticable, we muſt uſe ſome Stiptick applied directly againſt the Mouth of the Veſſel, and keep it fixed there with the Finger till an Eſchar is formed. By this Method, the Sides of the Wound ſuffer no Compreſſion or Cramming that can occaſion Inflammation. The Eſchar being made, the Wound is to be dreſſed ſoftly according to Art.

There are even Hæmorrhages which break out at the Time of receiving a Wound. A Surgeon who is converſant in Anatomy, and has found out the Path of the Bullet, whether it be in the Trunk or Extremities, knows what Veſſel is opened, and where that Veſſel is ſituated; conſequently he will be able to ſtop the Bleeding with Eaſe, by the Methods which we have laid down, eſpecially if he has an Opportunity of applying a Torniquet; becauſe the Torniquet giving him Command of the Blood, he can with Leiſure make proper Inciſions and thereby diſcover the opened Veſſel.

With regard to the moderate Bleeding of the Wound as a neceſſary Conſequence of thoſe Inciſions which we have recommended, we eſteem that uſeful, in preventing a Swelling from riſing on the Part; if we ſtop it by cramming up the Wound, we act in Oppoſition to our own Deſigns; the Truth is, it will ſtay of itſelf in a little Time, and therefore requires none of our Attention.

If a Bullet has paſſed by the large Blood-Veſſels in wounding any of the Extremities, poſſibly that Wound may not bleed, though a conſiderable Branch has been opened. But as a Hæmorrhage is to be dreaded upon the Separation of the Eſchar, and ſometimes even ſooner, it is convenient to leave a Tourniquet round the upper Part of the Limb, that it may be ready to be made tight, if the Hæmorrhage breaks out; for without this Precaution, the Patient is expoſed to the Danger of periſhing in his own Blood. If the Wound be on the Trunk of the Body, the Surgeon who is aware of what may happen, ſhould leave a ſkillful Servant with the Patient who may be able to check the bleeding.

Of the firſt Dreſſing.

THE Manner of Dreſſing ſhould always anſwer the Views which are laid down. Let us be on our Guard then and not blindly follow that Practice, which is almoſt generally received, of dreſſing all Gun-Shot Wounds the firſt Time, with Lint ſoaked in Brandy. I know the Application of that Liquor agrees well enough in monſtrous large Wounds, becauſe they are complicated with a proportionable Degree of Contuſion and *Ecchymoſis*; and that it is likewiſe proper in the Caſe of large Contuſions, where I have recommended deep Scarifications to prevent Mortification, which may quickly follow, conſidering the great Plenitude that is over the whole Limb. But then, I know as well that it can never agree but where the ſoft Parts have their Senſibility either blunted or intirely deſtroyed; for which Reaſon I abſolutely forbid the Uſe of it in every Caſe where we have been obliged to cut deep into the Quick, becauſe the ſmarting Heat which it excites in theſe Parts, acts directly in Oppoſition to the Relaxation which we would procure; and being a Dryer it will be more ready to retard, than to promote the Suppuration.

In this laſt Caſe I ſay therefore, 'tis ſufficient to fill up the Wound with a Quantity of Lint proportionable to it's Cavity; the Lint ſhould be very ſoft, and then it will be in no Danger of ruffling or preſſing too hard upon the Sides; and if it is applied in ſufficient Quantity, all the Blood or Humidities that may be diſcharged will be abſorbed by it.

The reſt of the Dreſſing ſhould coincide with the Intention, that is, the Bandage ought not to compreſs the Part. If any Bones are broken to Pieces, the Member if poſſible ſhould be placed pretty high, to facilitate the Return of the Fluids towards the Center of the Body, and carefully fixed, ſo that the fractured Pieces of Bone may not play againſt one another, eſpecially if there be a Neceſſity of moving the Patient to another Place.

'Tis neceſſary to obſerve that the Lint, which is put into the Wound, imbibing the Blood, converts itſelf into a Cake, which ſticks cloſe over all the Surface, and when the Bleeding is ſtayed, it gradually hardens with the Blood; then this Maſs of Lint and Blood ſtops up the Mouths of the Veſſels, and even irritates them by it's Stiffneſs, which may bring on Inflammation. To obviate this Inconveniency, as ſoon as the Wound ceaſes bleeding, without removing the Cake of Lint, we ſhould bath it with *Ol. Hyperici* warmed, which will ſerve as a Digeſtive for the firſt Dreſſing.

I ſtill obſerve ſome Surgeons in the Army, who, ſo ſoon as any Man receives a Gun-Shot Wound, dreſs it the firſt Time with Lint and Brandy, and content themſelves with that Dreſſing, till the Patient is carried to ſome ſafe reſting Place. I find no Fault with the Uſe of Brandy in this Caſe, becauſe the Wound being covered over with Eſchars, is conſequently inſenſible to the Application of any Liquor which you can uſe, but I cannot approve of uſing that conſtantly afterwards.

Other Surgeons again, poſſeſſed with a Notion of the Swelling which follows cloſe upon Gun-Shot Wounds, in the firſt Dreſſing make all the neceſſary Inciſions, and even perform the Amputation if it be requiſite;

quiſite; I prefer the Practice of theſe laſt, for the Reaſons which have been already given; if the Patient muſt be conveyed to ſome other Place, it may be accompliſhed with much more Eaſe, after all extraneous Bodies and Splinters are removed, after the Bones are reduced and kept in their natural Place, or even after the Amputation is performed, if a great Deſtruction in the Bone ſhould require it, than to carry the Patient in his preſent ſhattered Condition; for the jolting Motions which he muſt neceſſarily be expoſed to in being moved to another Place, might occaſion very painful Stretchings or Lacerations, and in Conſequence of theſe, Convulſions. Frequently after the Patient has been tranſported, the Amputation is found to be impracticable, on Account of the enormous Swelling that has ſeized on the upper Part of the Limb.

Of the Method of preventing or mitigating the Symptoms.

IT is not enough to have done every Thing that our Art directs with regard to the wounded Part; we muſt likewſe endeavour ſtrenuouſly to mitigate the Symptoms which already appear, and prevent others that may ariſe.

The Œconomy of the animal Machine is diſturbed only in Conſequence of the Blow; and that Diſturbance would riſe higher and higher, if the Source of the Irritation was not removed. We have therefore recommended the neceſſary Inciſions, which, tho' they may ſeem uſeful only to the wounded Part, conduce to alleviate the primary Symptoms; but theſe Inciſions would often be inſufficient, were they not ſeconded by a ſuitable Regimen, and by Evacuations, that may empty the Veſſels and *primæ Viæ*, re-eſtabliſh the Secretions which have been interrupted, and ſupply other Evacuations which have been ſuſpended; in ſhort, to ſet Nature to rights again.

Every Perſon knows that a *Plethora* of itſelf may give riſe to many Diſorders, ſince Health in a great Meaſure depends on an exact Equilibrium betwixt the Solids and Fluids. We know alſo that in a *Plethora*, the Circulation being carried on with a more ſluggiſh Motion than formerly, this Slowneſs is a conſtant Diſpoſition towards a Surcharge; the Quantity of the Secretions is now diminiſhed, and ſome of them even quite ſtopt up. Undoubtedly therefore in ſuch a State, the Cauſes of a Surcharge produced by a Gun-Shot will have a more certain and ſpeedy Effect.

But though the Patient be not previouſly labouring under a Plethorick Habit of Body, the Shock and Agitation which commonly follows Gun-Shot Wounds will be ſufficient to ſuſpend the Laws of the Œconomy for a few Moments: We have a Proof of this from the *Syncopes* and other primary Symptoms, which we have ſaid happen at leaſt often enough, to make us apprehenſive of other bad Symptoms ariſing in the Progreſs from the ſame original Diſorder.

Farther, if the Perſon's Stomach be loaded with Aliment when he receives a Wound, and if he throws not that up by Vomiting, as ſome of the Wounded do, his Digeſtion will be weak, and the ill concocted Chyle getting into the Maſs of Blood will become a heterogeneous Matter capable of producing another Series of bad Symptoms.

And here we take into the Account the wretched Food which Soldiers are obliged to live upon, and the Fatigues of a Campaign: The Intemperance of ſome Officers, with their Fatigues and Watching, conſpire to change the Leaven of the Stomach, to impair Digeſtion, to produce a bad Chyle, and conſequently brings on a Habit of Body more or leſs akin to a Diſeaſe. If a Perſon therefore in ſuch a Diſpoſition, receives a Wound, will not the Diſorder which that Wound excites through the whole Machine, quicken a Diſeaſe that has been gradually gathering Strength in Secret, and wanted only a little Time to break out? And in order to remedy or obviate all theſe Diſorders, we muſt take in the Aſſiſtance of Regimen, Bleeding, Vomiting, and ſometimes even of gentle laxative Medicines.

An exact Regimen is ſo much the more eſſential here, as the Patient's Digeſtion is bad, while the firſt ill Symptoms continue, and while he is conſtantly wearied out with Pain. Wherefore he muſt be reſtricted to the Uſe of light Broths, which will ſerve rather to lay than ſtir up any Efferveſcence in the Blood. There are however ſome Conſtitutions naturally weak, or languid through Fatigue, or exhauſted by a Hæmorrhage, where it would be dangerous to order great Severity in Diet; and where on the contrary we ought to ſupport and invigorate Nature.

Farther, it is always convenient to get Information about the Patient's former Manner of Living; becauſe all the wounded ſhould not be laid under the ſame Regulations in Diet *(a)*.

(a) Ambr. Paré, Ch. 10.

Bleeding is of prodigious Advantage here; nay, it is abſolutely neceſſary, if no conſiderable Hæmorrhage has preceded (*a*). By Bleeding we take off the *Plethora*, when there is ſuch a Habit; we alſo thereby either prevent a Swelling and Inflammation, or keep them from riſing to half the Height, by hindring the Blood from ruſhing too copiouſly into the injured Part; we thereby obviate a Plentitude which might proceed from an Efferveſcence of the Blood, though, in fact, the Veſſels be not full; in fine, after Bleeding, all the ſecretory Organs being freed of their Turgency, will have their natural Functions reſtored, if theſe have been interrupted. Wherefore we ought never to neglect Bleeding ſuch Patients in Time; and theſe Bleedings ſhould be proportionable to the Degree of their Strength, or Weakneſs, to the Largeneſs of the Injury, and to the Nature of the firſt concomitant Symptoms.

Experience has taught us, that ſuch of the Wounded as Vomit after receiving the Hurt, (and it often ſo happens) are not ſo ſubject as others to the ſucceeding bad Symptoms, and conſequently are more eaſily cured than theſe others: Thus Nature herſelf teaches us opportunely, to

---

(*a*) Mangel. Cent. iii. Chap. 8.

give a Vomit. An artificial Vomit may be uſeful in clearing the *primæ Viæ*, and thereby in throwing out the Seeds of thoſe Diſorders which are ſometimes impending and juſt ready to break out, as we formerly obſerved. I grant indeed, the Regulations of a ſpare Diet for the Patient, may ſometimes obviate theſe; but this End will be attained more ſurely by ſcouring the *primæ Viæ*, as Nature has demonſtrated in many Inſtances. Perhaps it may be objected, that this Method ſerves only to haraſs the Patient with an officious Adminiſtration of Medicines, and that Attempts to cure any Diſtemper before it ſhews itſelf are trifling. I anſwer, that it is not only better to prevent ſuch Diſorders, but that even their Cure will be a very difficult Buſineſs, when they are complicated with other bad Symptoms proceeding from a Gun-Shot Wound. At leaſt, we cannot diſpence with giving the Patient a Vomit, if his Stomach be full of Aliment; and it ſhould be taken down, as ſoon as poſſible after the firſt Dreſſing, that the crude undigeſted Chyle may not have Time to mix with the Blood. If it be long delayed, the Vomiting may be fruitleſs, or even dangerous.

Notwithſtanding the Advantages that are gained by Vomiting, the ſtraining Ef-

forts

forts which neceſſarily accompany it, would be prejudicial in ſome Caſes, as, for Example, in Wounds that penetrate into the Cavity of the Breaſt, or the *Abdomen*, when ſome *Viſcus* is injured; in Wounds of the Head with a ſhattered *Cranium*; in large Wounds on the fore-part of the Neck, and in ſome Wounds accompanied with Fractures on the Extremities, where Reſt is an eſſential Circumſtance. It depends on the Surgeon's Sagacity to compare the Advantage that may be reaped by Vomiting, with the Danger that may poſſibly ariſe from it, and then to conduct himſelf accordingly.

Evacuations by Stool may alſo ſometimes be uſeful; but during the firſt Days we muſt employ no Purgative, if the Oil of ſweet Almonds be excepted, which indeed we may look upon rather as a Sweetner than a Purgative, tho' it procures an Evacuation of what is contained in the inteſtinal Canal.

Suppoſe now that every Circumſtance of our Precepts with regard to the Wound has been followed, as near as could well be; 'tis poſſible however that a little Swelling may riſe on the wounded Part; but ſurely it will be a great deal more inconſiderable than if nothing had been done by way of Prevention. Beſides, every Inciſion is neceſſarily followed with a little Swelling on it's Edges; ſo that we need not wonder if that appears after a Blow from Fire-Arms, and after Inciſions have been made on the Part. But it will ſoon be diſſipated by the Suppuration, which ſhould begin to be eſtabliſhed about the third or fourth Day, and continue encreaſing not only until the Eſchars fall, but till the Plentitude of the Part be removed.

Of the ſubſequent Dreſſings.

A Wound produced by Fire-Arms is very different from one that is made by any cutting or pricking Inſtrument. In this laſt kind, nothing more is required than a Re-union of the divided Parts, which we can often accompliſh in a very ſhort Time: But a Gun-Shot Wound cannot be healed up without a Suppuration, on Account of it's Eſchar.

There is nothing, except an Itching or conſiderable Inflammation comes upon the Wound, that can induce us to take off the firſt Dreſſing ſoon; if theſe Accidents then give us no Trouble, we ſhould leave it on at leaſt two or three Days, that it may be ſeparated by the Suppuration, whether that be of a good or unkindly Nature; by this Means we will avoid giving the Patient Pain, or cauſing the Wound to bleed afreſh.

In this laſt Caſe, when Matters go on ſmoothly without any bad Symptom, the Wound muſt be dreſſed with Tenderneſs, ſo as to aſſiſt Nature in every Thing, who wants always to do what is right, and ſtruggles inceſſantly on her Part to perform the Cure. It is not the Medicines which we put into the Wound, that will cure it; and ſtrictly ſpeaking, we may ſay, that every Thing we apply there, is an extraneous Subſtance, whether it be Lint or Medicine. 'Tis Nature alone that muſt form theſe fleſhy Granulations that fill up a Wound, by Means of the nutritious Juices which ouze out from it's Sides; and it is Nature alone that can bring on a *Cicatrix*. How often may we obſerve Beaſts cured by licking their own Wounds? Wherein conſiſts our Buſineſs then with Regard to Dreſſings? I ſuppoſe that the neceſſary Inciſions have been made, that there is no extraneous Body lodged in the Wound, that there is no Hæmorrhage, and that the firſt Dreſſing is removed. All we can do then is to aſſiſt Nature, with various Means, according to her different Purpoſes, in different Stages of the Diſeaſe: The Eſchars muſt be ſoftened, in order to bring about their Separation ſooner; which in moſt Caſes may be done with ſimple or balſamick Digeſtives, or with green Balſam:

The too great Abundance of Pus muſt be abſorbed, which is done by putting a ſmall Quantity of dry Lint into the Wound: The fleſhy Granulations muſt be gently braced up in Proportion as they ſprout, by the Uſe of vulnerary and aſtringent Lotions, with which we muſt moiſten all the Sides of the Wound, if they become puffy: Laſt of all, Care muſt be taken in dreſſing, never to leave the Wound long expoſed to the free Air, and afterwards to cover it well up with Plaiſters and other Things, that the external Air may not get in, and corrupt the nutritious Juice which ſhould from the ſoft Granulations.

But if the *Ecchymoſis* has been very conſiderable, the Suppuration may likewiſe be very copious, on Account of the great Quantity of Fluids which have been extravaſated round the Circumference, and which will now be evacuated by the Wound; perhaps too the Suppuration may be bloody. We may expect here to meet with many different Kinds of Suppuration, which will depend ſometimes on the Nature of thoſe Fluids with which the Part was loaded; ſometimes on the Degree of Change which theſe Fluids have undergone during their State of Reſt; and at other Times, on the Quality of the nutritious Juice which is conſtantly brought to the Wound. If, therefore, unkindly Suppurations threaten to damage theſe Veſſels from which they are poured out, as we may know by the Figure of the Wound, and the Quality of the Pus, the ſimple Dreſſings which we have ordered above, will not be quite ſufficient; in this Caſe we are laid under a Neceſſity of uſing animated Digeſtives, which have a Power of correcting the Juices, and defending the Sides of the Wound, againſt the Corruption which might otherwiſe prevail. I ſhall not enter on a particular Detail of theſe Digeſtives, becauſe every Author is full of them; I would only obſerve that the Application of Oils and greaſy Medicines never agree here after the Eſchars are fallen. Among theſe warm Digeſtives I reckon the Spirit of Turpentine, which is the moſt excellent topical Application in all Caſes where Tendons, Membranes, or *Aponeuroſes* are concerned; for here whatever is greaſy or putreſcent melts down or attenuates the Suppuration which not only lays all the Muſcles expoſed, as if they had been dexterouſly diſſected with a Knife, but is very often followed with a Reflux of purulent Matter. Here, when the proper Scarifications have been made, theſe warm Digeſtives will relax

lax the Mouths of all the little Veſſels which are in a State of Conſtriction; and, animating the Load of Fluids round the Sides, will facilitate their Diſcharge into the Wound. Wherever there be Eſchars, theſe Medicines ſoften them, ſo that the nutritious Juice, endeavouring to make it's Way out by the Wound, ſeparates them ſooner. We muſt even diſtinguiſh the different Parts of the ſame Wound, that we may dreſs each Part according to the State we find it in; for, very often, there may be an Eſchar on the Part which the Bullet touched, while the Reſt of the Wound is clear and wants only to be healed up. I ſhall ſpeak in the fifth Part, of the proper Times of dreſſing, which ſhould be more or leſs frequent, according to the Variation of Circumſtances.

If any Hæmorrhage has been ſtopt, either by a Ligature made on the Veſſel, or by Stipticks, nothing muſt be laid upon the Wound but fine Lint covered over with the Powder of dried Turpentine, in order to retard, as much as poſſible, the Separation of the Eſchar or of the Ligature. And in the Time of every Dreſſing great Care muſt be taken to ſupport that Band of Lint, leſt it ſhould ſuffer any Violence in pulling off the other Things that cover the Wound. What I have laſt ſaid, relating to the Dreſſing of that Part, where a Ligature or Stipticks have been uſed to ſtop a Hæmorrhage, ſhould be obſerved alſo with regard to every Thing that is put into the Wound; for we ſhould never pull it away before it be quite ſeparated and looſe.

But in the Caſe which I have propoſed, where Inciſions or deep Scarifications have been made, to ſtop the Progreſs of a Gangrene, ſimple Dreſſings will no longer anſwer our Intention. The Wound and all the Part muſt be dawbed with Spirit of Wine mixed with Camphire and *Sal Armoniac*, to keep up their Life and Heat. And ſuppoſing Nature has now ſeconded the Endeavours of Art, the Wound is to be dreſſed with ſimple or animated Digeſtives, as it's different States require, until the Swelling diſappears, and the Eſchars fall off.

In this laſt Caſe, as well as in all thoſe we have formerly propoſed, we cannot expect to ſee a Suppuration capable of generating good Fleſh, till after the Part be completely diſſemboged of it's Plentitude. This Change may be known by the Softneſs of the Limb, which has gradually returned to it's natural State; by the Nature of the Pus, which is white and thick; and by the Look of the riſing Fleſh, which is firm, granulated, and of a deeper red Colour than formerly. Now we muſt lay aſide the Uſe of Digeſtives and all Applications that generate Pus, ſubſtituting in their Place ſpirituous and drying vulnerary Lotions, as I have ſaid above. Such Applications will be able to brace up the Mouths of all the little Veſſels, without which, inſtead of true Granulations, the beſt of Juices will very commonly produce nothing but a flabby ſoft Fleſh, that will in a ſhort Time fill up all the Wound. If one has allowed that Fleſh to get the Better of him,(and it is eaſily diſtinguiſhed from good ſprouting Granulations, by it's Softneſs, Smoothneſs, ſhining Luſtre, and frequently by it's Bleeding) ſuppoſing it be not very large, he muſt deſtroy it by thowing burnt Alum or red Præcipitate, *&c.* upon it. But if it has filled up all the Wound, which we ſometimes obſerve will happen in the Space of twenty four Hours, as that Kind of falſe Fleſh ſprouts always ſpeedily, the Surgeon in this Caſe muſt remove it with his Fingers, and he will find that it readily gives Way. When the Wound ceaſes Bleeding, he muſt apply Alum, Præcipitate, *&c.* to the Surface whence the fungous Fleſh was ſeparated, and thereby deſtroy the lax pouting Fibres that gave riſe to the Tumor, and could not be taken away by the Finger.

As ſoon as the Wound begins to be lined all over with ſound Fleſh, we may look upon it as a ſimple Wound, that will heal up in convenient Time, by uſing only ſimple Dreſſings.

The End of the firſt Part.

A TREA-

A
TREATISE
OR
REFLECTIONS,
Drawn from PRACTICE on Gun-Shot Wounds.

PART II.

Of the ſecond Claſs of bad Symptoms which may follow in Conſequence of Gun-Shot Wounds.

ANATOMY teaches us, that there is ſuch a Connection and intimate Sympathy betwixt all the Parts of our Body, that they all mutually ſtand in Need of one another, either to continue in a ſound State, or to execute their ſeveral determined Functions. 'Tis in Conſequence of this Connection that we ſometimes obſerve the Œconomy of the whole Machine thrown into univerſal Diſorder, by a Blow received from Fire-Arms upon any one Part alone.

The Shock with which the Patient ſometimes finds himſelf, as if it were, thunderſtruck at the Time of the Blow, together with the Commotion or Agitation, may be followed by very fatal Conſequences, as we have obſerved above: But this Diſorder of the Machine may be encreaſed by the ſucceeding Pain, by want of Sleep and Reſt, by the Fluids extravaſated into the Circumference of the Wound, and by a thouſand other Cauſes, which alone are ſufficient to diſturb or change the Order of the Œconomy, even when there is neither a preceding Oppreſſion nor Commotion. Thus all Sorts of Gun-Shot Wounds, whatever be their Degree of Largeneſs, may be followed with bad Symptoms, which ſhall not appear till ſome Days after receiving the Injury, as we ſhall ſee immediately.

Second Claſs of bad Symptoms in Wounds of fleſhy Parts.

Three Circumſtances may render the Wounds of fleſhy Parts ſuſceptible of theſe Accidents. 1 The *Ecchymoſis* and Contuſion, when they are very conſiderable. 2. The Stricture or Tenſion, when it ſtill ſubſiſts. 3. The

Preſence of ſome extraneous Body, which remains in the Wound.

If the *Ecchymoſis* and Contuſion be large, we meet with unkindly Suppurations, for the Reaſons which have been already particularized, and often likewiſe with ſoft, puffy, fungous Fleſh, which muſt be corrected or deſtroyed, as we have ſaid above. If at the ſame Time the Fever continues, which is almoſt always the Caſe, this is another Cauſe for encreaſing the Diſorders which ſeize upon the Wound; becauſe there being a continual and mutual Communication betwixt the wounded Part, and all the reſt of the Body, by this Means ſome of the extravaſated Fluids may be conveyed into the Rout of the Circulation, and there diſturb that inteſtine Motion which the Author of Nature has imprinted on our Fluids, and on the Nature of which their good or bad Qualities depend. We ſhall ſpeak immediately of the diſmal Conſequences that may ſpring from this Cauſe.

If the Tenſion of the nervous Syſtem ſtill ſubſiſts, beſides the various Tumults which it may occaſion in the Œconomy of the Machine, the Wound continues remarkably dry. 'Tis true indeed, that a Suppuration is harder to be advanced in Gun-Shot Wounds, than in others, on Account of the Eſchar; but there is a wide Difference betwixt a Wound that requires ſome Days before it grows moiſt, and one that continues dry for the Space of eight or ten Days, as in the preſent Caſe. I ſay then, that the Wound will continne dry ſo long as the Fluids are impeded in their free Courſe through the ſmall Veſſels. In this Caſe, as the bad State of the Wound is relative to that of all the Limb, and even of the whole Body, it does not alone require the Surgeon's Attention. He muſt labour by all Means to ſtill the tonick Convulſion of the nervous Syſtem, to correct the antecedent Cauſe, to reſtore the Secretions and Evacuations which have been interrupted; in one Word, to ſet Nature to rights again, without which the Wound will grow malignant, and the Patient will loſe his Life through a ſeeming ſlight Indiſpoſition.

If the Ball, a Piece of Cloth, or any extraneous Body be left in the Wound, the Suppuration can hardly be eſtabliſhed, the Wound pours out only a thin ſerous Matter; and after ſome Days are expired, that extraneous Body commonly raiſes Inflammation, and waſtes all the ſurrounding Fat and Membranes. I have ſeen this Accident happen more than fifteen Days after the Wound was inflicted. At this Time the Pain which the Patient complains of, and the Redneſs, of the Skin, indicate the Place where the extraneous Body lodges, and conſequently where we ſhould make an artificial Opening for it's Extraction. If it ſo happens, that the Matter, which is formed in the Cell where the extraneous Subſtance reſts, makes it's Way outwards by a Conduit terminating in the Wound, a Sound or Directory introduced into that *Sinus* will ſerve to guide the Inciſion. The extraneous Body being diſlodged, the Wound will probably take a favourable Turn. *Ambroiſe Paré*, in this Caſe, gives no Orders for making an Inciſion; he propoſes the Uſe of Medicines, which, to uſe his own Expreſſion, *have a great Power of drawing out Bullets, or other extraneous Bodies.* He thinks likewiſe that the Suppuration may work out theſe Subſtances, and adds, *that there are other Remedies which are poſſeſt of this Faculty by Putrefaction, ſuch as the Dung of Animals, and Leaven.*

Second Claſs of bad Symptoms in Wounds of tendinous Parts.

The ſecond Claſs of Accidents that occur in Conſequence of a contuſed Wound in tendinous Parts, is very conſiderable; and if they do not always appear from the firſt Day of the Injury, it is becauſe theſe Parts being bathed and nouriſhed by lymphatick Veſſels, where, as every Perſon knows, the Lymph circulates much more ſlowly than the Blood in larger Veſſels, conſequently the Surcharge requires more Time, though it be more eaſily formed here than elſewhere. Would we know the Cauſe of this Plenitude? We may find it in the vibrating Tenſion of the Nervous Syſtem. The pent up Lymph undergoes a Change of it's Nature, and thereby generates an *Eryſipelas* which ſpreads over theſe Parts; for the *Eryſipelas* is a Diſeaſe of ſuch Parts as are more copiouſly ſupplied with Lymph, than Blood, I mean Membranes, *Aponeuroſes*, &c. On whatever particular little Place it begins, from thence it ſpreads out, ſeizing gradually on thoſe Parts that are of the ſame Texture, and at length reaches the Skin, which grows red and ſomewhat orange coloured. Then we often ſee the *Eryſipelas* communicated all along the Member, even to the two Articulations; which happens the more readily as the Ligaments, *Capſulæ*, and *Aponeuroſes* that embrace theſe Joints, have ſuffered a Shock and Agitation at the Time when the Blow was ſtruck. The Progreſs of this Diſtemper ſhows itſelf by the Swelling of the Articulation, by the Pain, and by the Redneſs of the Part.

An *Eryſipelas* of tendinous Parts is known to terminate always either by Diſcuſſion or Suppuration: But the Diſcuſſion being the more deſirable Method, we ought to promote that expeditiouſly, by ſuitable and repeated Bleedings, according as the Strength of the Patient will bear, and by applying topical Emollients and Diſcutients over the whole Extent of the Diſeaſe, avoiding always greaſy Medicines either upon the indiſpoſed Limb, or in the Wound. If the *Eryſipelas* takes the Way of Diſcuſſion, the Swelling of the Part is obſerved to diminiſh inſenſibly, and the Skin gradually returns to it's natural Colour. The Wound after this cleanſes more and more every Day. But if the *Eryſipelas* takes not this Turn ſpeedily, it degenerates into an Inflammation, the Swelling riſes higher and higher, the *Aponeuroſes* rot, and their Corruption diffuſes a ſanious Suppuration under the Skin, which obliges new Inciſions to be made. This Sort of Corruption or Suppuration never happens, but at the ſame Time the Patient is haraſſed with a Fever, Head-Ach, Reſtleſſneſs, and frequently alſo with a Looſeneſs of his Belly. If the fleſhy Parts become inflamed at the ſame Time, the Swelling may turn out ſo conſiderable in the Space of twenty four Hours, that the whole Body ſhall participate of it, and the Limb be threatened with a Gangrene.

This Calamity falls out more eſpecially when ſome large Bone has been fractured, at the ſame Time that a great many tendinous Parts have been lacerated *(a)*: Becauſe, in this Caſe, beſides the Laceration, there has been an Agitation proportionable to the Reſiſtance of that Bone.

What terrible Diſorders often attend this State of a Wound, or ſoon follow in Conſequence of it! An acute Fever, Tenſion of the *Abdomen* with a Suppreſſion of the *Fæces*, followed by Inflammation, Convulſion of particular Parts, and unkindly Suppurations. Experience even teaches us that all theſe ugly Symptoms often mutually hatch one another, each of them being reciprocally ſometimes the Cauſe and ſometimes the Effect.

The Agitation communicated by the Blow, had firſt raiſed a Fever, on more Accounts than one; the vitiated Fluids which the Torrent of the Circulation ſweeps in, redoubles the Fits, and heightens it's Violence; then the Patient's Belly frequently ſwells up, becomes tenſe, and even painful, which indicates an inflammatory Diſpoſition of the Inteſtines and Stomach; and in Conſequence of this, ſome Patients are ſo conſtipated, that no Evacuation can be made, either by Stool or Urine, while others again fall into a *Diarrhœa* that leaves

---

(a) Ambr. Paré, *Playes d'Arq. Ch.* 1.

them no free Interval. The Nature and Degree of the Irritation is what determines the one or other of theſe ſymptomatick Diſorders. If the Inflammation riſes higher, it is ſoon followed with a Hiccup, becauſe it has reached that Portion of the *Peritonæum* that covers the Diaphragm; and this will ſoon be followed with a Light-Head, and even *Delirium:* Happy the Patient, if this laſt Symptom is not owing to ſome of the Diſeaſe ſettling, with Suppuration, on the Membranes of the Brain; for the Patient, in ſuch a Caſe, is ordinarily beyond Hope.

We often obſerve a ſudden Reflux of purulent Matter forming Abſceſſes in Parts that are at a great Diſtance from the Wound; and a great many Cauſes may produce that Reflux, ſuch as the Inflammation of tendinous Parts, the Fever, *&c.* without our being able to prevent it. If this Reflux be carried on by the lymphatick Veins which run towards any Emunctory, and if all the abſorbed Matter be ſtopt, there the Abſceſs will be formed, and the Patient may recover. But if it be carried on by Lymphaticks that open into the Blood-Veſſels, or by theſe Blood-Veſſels themſelves, the purulent Matter being conveyed into the Stream of the Circulation, ordinarily fixes upon the Lungs, or upon the Liver. This Reflux of Matter is indicated

dicated by irregular Shiverings, followed with violent Acceſſions of a Fever, accompanied with clammy Sweats; and theſe cold-Fits often ſucceed one another very quick, till the Patient expires. If the Matter be depoſited on the Lungs, an Abſceſs is formed there; and when that Abſceſs breaks, the Pus is almoſt always diffuſed upon the Diaphragm. If the Diſeaſe ſettles on the Liver, one or more Abſceſſes are formed under it's exterior Coat; and when theſe Abſceſſes break the Pus is poured out into the *Abdomen.* In ſhort, if the purulent Matter in the Blood, throws itſelf upon any Part, where we cannot reach with the Aſſiſtance of Surgery, the Patient muſt unavoidably die.

Such an univerſal Tumult both in the Œconomy of the Machine, and in the indiſpoſed Limb, is more than enough to bring the Diſorder into the Wound. As the Inciſions which have been previouſly made, afford not always a free Diſcharge to all the Fluids which have immerged the Limb, thoſe which reſt long there, grow more and more acrid, and then fill the Wound with a grey, yellow or greeniſh coloured *Serum,* that ordinarily ſmells ſour, but ſometimes, even cadaverous. We muſt not expect therefore to meet with kindly Suppurations in ſuch Sort of Wounds, till the Accidents be firſt appeaſed. Even a Gangrene may quickly enſue, if Care be not taken to prevent it, either by freſh Inciſions and Scarifications, as we have formerly directed, or by Amputation of the Limb, if it be practicable.

With regard to the other Helps which Art points out, and to thoſe which ariſe from Regulation of Diet, we can propoſe nothing in particular, but to repeat Venæſection and the mild Laxatives, in ſome Circumſtances to uſe Cordials, and in others quieting Medicines and Opiates. It muſt be left to the Surgeon's Diſcretion, to regulate and proportion all theſe according as the Emergency of the Caſe and Strength of the Patient ſhall require.

We have formerly taken Notice, that Convulſions may ſeize upon any Member indifferently, ſometimes one, and ſometimes another, only from an Irritation of the nervous Syſtem; but more commonly they are obſerved to come upon the wounded Limb, being occaſioned by the Compreſſion, Pricking, or Laceration of ſome large Nerve, Tendon or *Aponeuroſis*. Convulſions may even happen ſometimes here, from the ſimple Irritation which theſe Parts, when expoſed in the Wound, may be liable to, either from the Splinters that remain, or from the acrid Nature of the flowing

Juices, or from repugnant Medicines, or even from too frequent Introduction of a Sound or Finger into the Wound. In this Caſe help muſt be ſpeedily adminiſtred, which will conſiſt in extracting the Splinters if any remain, in dividing the Tendon above the Place where it is pricked, in unbridling anew the wounded *Aponeuroſis*, or in changing the Application. If this be neglected, the Convulſion, which was only particular, will become univerſal, and the Patient muſt die.

Of Contuſion of the Bone.

The Accidents which are ſubſequent to a Contuſion of the Bone without a Fracture, come likewiſe into the ſecond Claſs. Suppoſing that we have at firſt made the neceſſary Inciſions, we cannot be too attentive in obſerving what paſſes, for ſome Days are required before the Wound ſhews the Injury.

We may know that the Membrane which lines the internal Parts of the Bone has ſuffered, and is diſpoſed to ſuppurate, by a fixed Pain at the Bottom of the Wound, by the Wound's being extremely ſenſible, by the pale decayed Hue of it's Fleſh, by the Colour of the injured Bone which has loſt it's natural Whiteneſs; laſtly, by the liquid Suppuration, which ſpreads over the whole Bone and ſeparates the *Perioſteum.* Here we have the Choice of two; either to amputate the Limb, or to apply one or more Heads of a Trepan upon the contuſed Part, as we do on the *Cranium* when there is an Extravaſation upon the *Dura Mater*, occaſioned by a Contuſion of that bony Caſe.

Of Hæmorrhages.

In the ſecond Claſs of Accidents I likewiſe reckon certain Hæmorrhages, that break out, about the ſeventh or eighth Day after the Injury is received, which is the Time when the Eſchars fall. This Blood certainly flows from ſome Veſſel that has been deſtroyed by the Contuſion, and had it's Orifice blocked up by the Eſchar (*a*). We muſt endeavour to find it, as has been formerly directed, and ſtop it's Bleeding in the Method we have there laid down. In this, as well as in every Caſe, where we are under Fears of a Hæmorrhage, whether the Bleeding has been ſtayed artificially, or of itſelf, we muſt order the Patient to keep himſelf very ſtill, and to guard againſt the leaſt ſtraining Effort; becauſe the Swelling of the Muſcles, which neceſſarily attends every ſuch Effort, accelerates the Motion of Fluids in all the Veſſels, and this greater Impulſe of theſe Fluids may drive out the

---

(*a*) Ambr. Paré, Ch. 10.

little Clod which ſerved as a Plug to the opened Veſſel. We have ſeen ſtopt Hæmorrhages break out anew from this Cauſe, more than fifteen Days after, when the Wound has been beginning to cicatrize, *Read my Chyrurgical Obſerv. Vol.* 1. *Obſerv.* 48.

Before we put an End to this Chapter of the ſecond Claſs of Accidents, it is proper to ſpeak ſomewhat of certain Evacuations by Stool, which ſometimes come on, a few Days after the Wound is inflicted, and which are apt to be miſtaken for a dangerous *Diarrhœa.*

So far from being bad Symptoms, theſe Evacuations are, on the contrary, extremely uſeful, when they happen after that Coſtiveneſs which we have ſpoke of above; and they are known to be critical, becauſe at that Time all the ugly Symptoms decline, and what had the Appearance of a troubleſom *Diarrhœa*, is no more than an Evacuation or Derivation which Nature has made to throw off her Load. The favourable State of the Wound is a convincing Proof of this; hitherto it participated in the general Embarraſment and Indiſpoſition, but now it looks more kindly; ſo that, inſtead of checking ſuch Evacuations, we muſt endeavour to promote them by Lenients, and even by ſoft, mild Laxatives, ſuch as the Oil of ſweet Almonds, gentle Glyſters, and other Things of that Nature, when we obſerve them to abate too ſoon.

Theſe Evacuations muſt likewiſe be conſidered as critical, when they happen to Men of a fat or full Habit, if at the ſame Time the Fever ſubſides, and the Wound does not take a pale dead Colour. Yet if theſe Evacuations continue too long, they will exhauſt the Patient; and therefore whenever we have reaſonable Apprehenſions of that, we ſhould gradually put a Stop to their Progreſs, by giving incraſſating Aliment, abſorbing Powders, or Stomachicks, ſuch as Theriac, *Diaſcordium*, *&c.*

The End of the ſecond Part.

A
TREATISE
OR
REFLECTIONS,
Drawn from PRACTICE on Gun-Shot Wounds.

PART III.

Of the laſt Claſs of Accidents which may occur in the Courſe of Dreſſing, and in Conſequence of Gun-Shot Wounds.

WE ſometimes ſee Accidents fall out, a long Time after the Perſon has been wounded, and when we leaſt expect them; Accidents which we neither foreſaw, nor indeed could foreſee, on Account of the favourable State of the Wound. Some of theſe follow in

Conſequence of ſome ill Quality in the Fluids, and others are owing to the Nature of the Wound.

The Accidents that are in Conſequence of an ill Quality of the Fluids, are, Abſceſſes, Want of Sleep, *Delirium*, Convulſions, *Diarrhœa*, *Teneſmus*, Jaundice, ſome particular Virulency unſheathed, and Conſumption. Thoſe which depend on the Nature of the Wound, are, *Fiſtulæ*, and Atrophy of the wounded Limb.

Of the ſubſequent Abſceſſes.

Sometimes during the Progreſs of Cure, internal Abſceſſes are formed, in Conſequence of which, the whole Laws of the Œconomy are quickly diſturbed, and the Wound, which till now ſeemed in good Condition, immediately takes a bad Aſpect. Some of theſe are produced, either by the Oppreſſion which the Patient ſuffered at the Time of the Blow, or by the original violent Shock, which raiſed ſuch a Tenſion, that the Motion of a great many Fluids was thereby ſuſpended; as we formerly obſerved. But it is very poſſible, that ſuch obſtructed Fluids ſhould in one Part or another grow acrid in their Confinement, rather than be conveyed into the Circulation, and there form Abſceſſes, ſooner or later, in Proportion to the Quality and Quantity of the obſtructed Fluid.

If the Stomach was loaded with Aliment when the Hurt was received, the Digeſtion muſt have been impaired, and the ill concocted Chyle getting into the Blood may have ſo corrupted it gradually, as to produce at laſt great Diſorders, and form Abſceſſes. The bad Leaven that was in the Blood previous to the Wound, may alſo have been an original conſpiring Cauſe. This may likewiſe be occaſioned by the Intermiſſion of ſome habitual Evacuation, which has been ſuſpended ever ſince the Hurt was received, ſuch as the Hæmorrhoidal or any other Diſcharge. In all theſe Caſes, the Plenitude, or local Diſtemper, is commonly indicated by a fixed Pain in the Part; and the Suppuration that comes on there, is attended with the Symptoms which we know always accompany the forming of Pus. We ſometimes, however, meet with uncommon Symptoms, ſuch as *Delirium*, and Convulſions, which ariſe from the Nature of the Part where the Pus is formed. At this Period, the Wound is ruffled, and never aſſumes a good Colour, until you procure an Evacuation of the Pus contained in the Abſceſs. But if that be formed in a Part where an Evacuation of the Matter cannot take Place, the Patient will probably be carried off.

Of Want of Sleep.

Though the want of Sleep, which is not occaſioned by Pain, may appear to be of no great Conſequence, it is ſtill a Symptom which gives us Room to be apprehenſive of a real Diſeaſe; for as Sleep is one of Nature's Operations, there is undoubtedly ſome ſecret Broil in the Œconomy, when the Patient cannot reſt. This reſtleſneſs often uſhers in the Abſceſſes, of which I have been ſpeaking; becauſe it is hardly poſſible that a Suppuration ſhould be advanced in any Part, without ſome of the fermenting Fluids being conveyed into the Blood. A Want of Sleep may however happen, when there is not Reaſon to apprehend an Abſceſs; but it always indicates ſome irregular and preternatural Tumult in the Blood, or ſome Ferment or heterogeneous Fluid in the *primæ Viæ*, which is ſent by little and little into the Maſs of Blood. This Symptom commonly yields to Bleedings repeated as the Patient's Strength will bear, a careful Lenient and cooling Diet, gentle Evacuations, and ſometimes even a Vomit. Afterwards, mild Narcoticks may take Place; but when exhibited ſooner, they will only retard the Evacuations which ſhould carry off the Cauſe of the Diſorder, and thus do more Harm, than any Good we can propoſe from them.

Of the Subſequent Diarrhœa.

After tedious and large Suppurations, we often obſerve a Looſeneſs follow, which is the more difficult of Cure, as it is produced in Conſequence of an impoveriſhed State of the Fluids. This *Diarrhœa* is attended with Leanneſs of the Patient, Loſs of Appetite, ſomewhat of a ſlow Fever, and pale Colour of the Fleſh of the Wound. If any Thing cures, it muſt be the Uſe of light Vulneraries and Stomachicks, with gentle Narcoticks; and all theſe ſeconded with ſucculent incraſſating Nouriſhment of the eaſieſt Digeſtion.

Beſides, a Symptomatick *Diarrhœa* may enſue, from a concealed Suppuration of ſome inflamed Part in the Neighbourhood of the Wound, the Matter of which is not perceivable by the Touch, becauſe it is always abſorbed as ſoon as formed. This kind of Suppuration is only to be detected by an accurate Examination of the whole Member, in order to find out if there be any Part more puffy, red, ſoft, or œdematous than the reſt, or any particular Place that gives Pain. We have often lighted on theſe Suppurations, after the Death of Patients who had undergone Amputation of the Limb a Month or ſix Weeks before. This *Diarrhœa* cannot be ſtopt, without removing the Cauſe; that is, without we make one or more Inciſions upon the diſeaſed Part, of a ſufficient Depth to diſcover the Diſeaſe, and to give a free Diſcharge to the Fluids that are ſurcharged on the Part; which is the more neceſſary, as theſe Suppurations are generally ſeated between the *Perioſteum* and Muſcles.

Of the Teneſmus.

The *Teneſmus* is an Accident which often enough ſucceeds the *Diarrhœa*, eſpecially that kind of Looſeneſs which is owing to a Depravation of the Blood, encumbered with ſome heterogeneous Matter. It begins with a Heat only, in the *Inteſtinum rectum*, which is extremely troubleſom, eſpecially when the Perſon goes to Stool: It is continued, by the Inflammation of the inner Coat of that Inteſtine; and the Inflammation terminates very often in Ulcerations of that inner Coat.

Beſides Bleeding, which is of great Service in this Caſe, if the Inflammation continues, we muſt uſe Injections. Theſe will mitigate the Inflammation by their emollient and diſcutient Quality; and by their Quantity they will ſcour away the ſharp *Fæces*, which are always falling down into the *Rectum*, and giving the Patient Diſquiet. If Ulcerations are produced there, we muſt, for the firſt two or three Days, dreſs them with proper Deterſives carried into the Gut, either by Injections, or by loading ſmall Tents with *Pomatum*, and introducing them in the Manner of a Suppoſitory, and afterwards throwing up deſiccative Injections.

Of the ſubſequent Jaundice.

Though the capital firſt Claſs of ill Symptoms, which the Oppreſſion and Commotion occaſioned, be over, yet the Shock which the Conſtitution ſuffered from theſe, may have dangerous Conſequences; ſuch is the Jaundice, which ſometimes happens; but this Jaundice which appears not till ſometime after, in the progreſs of Cure, is very different from that which occurs with the firſt Claſs of Accidents: This which comes on late is more tedious and more difficult of Cure, becauſe now the Liver is ſurely diſeaſed, and the Bile is not ſo freely ſecerned as formerly. From whatever Cauſe the Diſeaſe proceeds, the Œconomy of the whole Machine is thereby thrown into Diſorder; for a Fever riſes, the Digeſtion is impaired, and the Evacuations by Stool are ſuſpended: Very often the Bile with which the Blood is loaded, tinges the Matter of the Wound yellow, which by it's Acrimony gives the Patient troubleſom Twitchings. In this Caſe, we muſt conſult the different Indications, to remedy this new Diſtemper, which differs in nothing from theſe common Jaundices, which have their Cure treated of in the medical Pathology. All that we can ſay here, is, that Bleedings proportionable to the Exigence of the Caſe, the Bitters with Diureticks, Steel Medicines and gentle Purgatives, are extremely conducive to remove Obſtructions of the Liver, to re-eſtabliſh the Secretion of Bile, and to prevent the Dropſy, which often ſucceeds this kind of Jaundice.

Of the unſheathing of ſome Virus.

During the Cure of Gun-Shot Wounds, we ſometimes find our Patients taken with pocky or ſcorbutick Symptoms. This contains nothing wonderful, ſince we know that endemial Diſeaſes do not always ſhew themſelves outwardly, ſo ſoon as the Fluids are tainted.

With regard to the pocky *Virus*, we all know that it is limited to no determined Period, and that a Perſon may have the Pox a conſiderable Time, without it's ſhewing itſelf externally by any Sign. This Venom then, may happen to be diſcloſed during the Management of a wounded Perſon; and it is very poſſible that the various Changes which the Commotion, Pain, and Fever have raiſed in the Fluids, may have alſo unſheathed the pocky Venom, which otherwiſe would not have ſhewed itſelf ſo ſoon. This *Virus* is corroſive with regard to the Solids, ſince it produces Ulcerations; but it is coagulating with reſpect to the Fluids, ſince it brings on Induration of Parts, before they ulcerate. Thus by it's coagulating Power it may work in oppoſition to thoſe Efforts of Nature, which, with the Aſſiſtance of Art, promote the Depuration of the Blood from all the Feculencies that may have been generated in it, by the Suſpenſion of ſome Secretions. When the Inflammation is over, when the Digeſtion of the Wound is eſtabliſhed, and when the Fury of the Symptoms is abated, ſuppoſing pocky Symptoms appear on the Wound or any other Part, we muſt put the Patient into a Courſe of antivenereal Medicines, in order to curb theſe Symptoms and palliate the Diſeaſe, till a proper Time comes when we can ſet about a radical Cure.

The *Virus* of a Scurvy is not ſo ſlow in making it's Appearance as that of a Pox. The Fatigues, together with the unwholeſom Diet of a Campaign, very often gives the Blood a Diſpoſition towards it; and on this Account it more frequently ſeizes upon thoſe Patients that are wounded in the End of a Campaign, than ſuch as were wounded in the beginning. Every Diſaſter that accompanies a Wound, may ſerve to unbridle this, as well as the pocky *Virus*. It ſhews itſelf by black Stains particularly on the Legs, by Pains in the Muſcles of theſe Parts, by Swelling and Bleeding of the Gums, by the Edges of the Wound ſwelling and becoming of a blueiſh Colour; laſt of all by the Complexion of the Fleſh in the Wound, which changes to a duſky red. If this virulent Leaven be allowed to encroach, it will taint more and more, till in a little time it vitiates the whole Maſs of Fluids; therefore we muſt put a ſtop to it by the uſe of Antiſcorbuticks, which I need not here particularize, but which every one may chooſe out and accommodate to the State of his Patient.

Of Conſumption.

Some of the wounded fall inſenſibly into a Conſumption. In ſome of theſe this proceeds from a Depravation of the Principles of the Blood, occaſioned by the Train of Diſorders attending the Wound, and therefore a Redreſs in this Caſe is more the Buſineſs of Nature than Art. In others, the Conſumption is cauſed by the great Waſte of Juices, which is unavoidable in long ſtanding and large Suppurations. This Diſorder is more eaſily prevented than cured. For which Reaſon, after the twentieth Day of the Wound, if the general or particular Inflammation be abated, if the Wound be in good Condition, and if we can judge from the good State of our Patient, that the former Regimen and Evacuations have quite reſtored Nature to herſelf, we muſt with cautious Prudence give proper Nutriment in ſuch Quantity that the Acquiſition may equal, as near as poſſible, the daily Loſs, which is now encreaſed by the Diſcharge of Matter. If the *Maraſmus* be already advanced ſome Length, we can have no Hope of keeping it off, but by a choice Diet, eſpecially of the incraſſating kind, ſuch as Milk, Cream of Rice or of Barley, *&c.*

Of Fiſtulæ.

Gun-Shot Wounds may remain fiſtulous on many accounts.

1. When the Wound penetrates into ſome large Cavity, ſuch as the Breaſt, for Example, and is accompanied with great Loſs of Subſtance.

2. When there has been a Bone much damaged, and ſome of the Splinters remain, whether the Surgeon has neglected to make proper Inciſions for their Extraction, or whether the Nature of the Part, or Depth of the Wound has made theſe impracticable.

3. When the Wound heals up, before the neceſſary Exfoliations have been completed.

4. When the foreign Body, that made the Wound, remains ſtill in it.

In the firſt Caſe, I take upon me to ſay, that the Miſchief is irrepairable; for the Surgeon is no Creator; he can neither make Fleſh nor Bones; he can neither bring the Lips of the Wound into Contact, by a Suture, nor by any kind of Bandage; and if Nature herſelf does not fill up all the Subſtance that has been loſt, or if ſhe does not bring the divided Lips together, that Wound muſt continue fiſtulous. Art can do no more here, than cover the Loſs of Subſtance, either with a ſuitable Bandage, or with a metal Plate, molded and adjuſted to the void Space. Theſe *Fiſtulæ* ſend forth Pus, *Serum*, or *Sanies*, which ſometimes comes from a diſtant Source: And therefore the Surgeon, who may know what are the vitiated Parts in the Bottom of the Wound, by the Nature of their Diſcharge, ſhould introduce proper Applications, by uſing deterſive, vulnerary, or deſiccative Injections, according to the Exigence of the Caſe.

A *Fiſtula* that remains in Conſequence of a ſhattered Bone is not always ſo difficult of Cure. The Wound continues fiſtulous, only becauſe there are ſome Splinters to come out, and theſe will make their Way whenever they have got quite free of their Fleſhy Attachments, which ſometimes requires a long Time. That Nature may drive them out, of her own Accord, 'tis neceſſary that they firſt loſe all living Commerce or Circulation with the neighbouring Parts; and if the *Fiſtula* be then too narrow for their Diſcharge, an Abſceſs is formed, in opening which, we find the ſeparated Piece of Bone. In certain Caſes, the Surgeon may rip up the Wound again, in order to divide their Connexions with greater Eaſe.

With Relation to Exfoliations, the Pieces which are to ſeparate from the ſound Bone, may be a long time, and even many Years, about that Work; during which Period, we ſometimes ſee the Wounds heal up and open again at various Intervals, to let out ſome little imperceptible Bit of Bone. Nature may be aſſiſted by Art in this Caſe, with pumping and bathing in hot Water: We know that hot Water ſwells up all the little Veſſels, renders them in ſome meaſure varicoſe, and by that means gives them Liberty of tranſmitting a greater Quantity of Fluids. This Freedom of Circulation ſooner protrudes the dead from the living Part, which is all we mean by Exfoliation. Beſides, the Swelling of the Fleſh, which is procured by the hot Water, lays it under a Neceſſity of being pricked and irritated with the Points of the little Bone that is caſting off; whence it is, that the Wound opens to give it Paſſage.

Laſt of all, the extraneous Body remaining in the Part, may keep the Wound from healing; and it will continue fiſtulous till that Body be diſcharged, provided it hinders the Wound to cloſe, and the Lips to unite. Pieces of Cloth or Linen, a Bullet when converted into an angular form, or any other irregular figured Subſtance, will almoſt always have this Effect. The Method of Cure in ſuch a *Fiſtula* conſiſts in opening the Wound, and taking out the extraneous Body. If a Wound has been known to heal while the Bullet remained in it, 'tis becauſe that Bullet, preſerving it's round Figure and ſmooth Surface, had made Way for itſelf by it's own Weight among the Muſcles, and was no longer, properly ſpeaking, in the Wound. We have ſeen ſome of them, run through a long Tract in the ſpace of ſeveral Years; but that is the Work of Nature, which we are not obliged to account for; and it is only in ſuch a Caſe that the Wound heals up completely. When the Bullet thus loſt is carried to any place, where it can be perceived by the Touch, if nothing forbids, we ſhould make an Opening, by cutting whatever covers the Bullet, and ſo take it out.

Of the Atrophy. The waſting of wounded Parts is an Accident which often enough ſucceeds the Cure of large Wounds. The ſpare Diet which has been preſcribed the Patients, and the Evacuations they have ſuffered during the Cure, renders them lean; and conſequently the wounded Member, like all other Parts of the Body, grows thin or falls away. But this Thinneſs is not what I regard as a ſubſequent Accident. What I look upon as ſuch, is a kind of drying of the Limb that was wounded, and which is found to be actually more waſted than the reſt of the Body. This happens chiefly after the Cure of deep Wounds in the Extremities, or in conſequence of Wounds in the Joints; and 'tis owing to one or other of theſe two following Cauſes. The firſt is a large Suppuration, by which there has been a great Expence of the nutritious Juice of the Part. 'Tis true indeed that our Fluids circulate round, and Nature ſupplies the Suppuration from the common Maſs; but, while all the Veſſels of the other Parts preſerve their Diameters, by the contained Fluids ſupporting and bearing againſt their Sides, thoſe of the wounded Part do not, but ſhrink up becauſe their Fluids eſcape freely through the Wound: Thus the Part receives gradually leſs and leſs Nouriſhment, and the Acquiſition of nutritious Juice equals not the Expence. The *Cicatrix* may be another Cauſe of Atrophy. This is not a proper Place for explaining how a *Cicatrix* is formed; let it ſuffice to obſerve that there is not the ſame Organization here as in other Parts, and that the Circulation is more ſluggiſh than elſewhere, on Account of the Firmneſs and compact Texture of it's Subſtance. For every Perſon knows that all Scars are very hard, and that they bridle up the circumambient Parts, in Proportion to their Extent. If therefore the Wound has been large and deep, the Circulation will be very much impeded, which is a ſecond Cauſe of Atrophy in the Part.

If there be any poſſible Method of remedying this evil, it muſt conſiſt in ſoftening the *Cicatrix*, in ſtretching out, and as it were rendering all theſe little Veſſels varicoſe, that Nature has formed too ſmall, which will give a more free Paſſage to the Fluids. With this View, after the Cure, we have often ſucceſsfully uſed the hot Bath and Pump, which ſhould never be tried ſparingly, and which the Surgeon's Diſcretion ſhould accommodate to the different Circumſtances.

The End of the third Part.

A TREATISE OR REFLECTIONS, Drawn from PRACTICE on Gun-Shot Wounds.

PART IV.

Of Gun-Shot Wounds in particular.

AFTER having ſtrictly examined all the different kinds of Wounds that can be made by Fire-Arms, in general, and treated of the Means which Art preſcribes for their Cure, it may appear unneceſſary to enter into a particular Detail of them. But in the mean time, if we reflect on the different Structure of the various Parts which enter into the Compoſition of our Bodies; we may eaſily conceive how the Wounds that are inflicted on them, muſt neceſſarily vary according to that Structure; and thus that each demands ſome particular Conſideration in the Method of treating them: Wounds of the *Cranium*, for Example, are not liable to the ſame Accidents as thoſe of the Tongue, nor are they treated in the ſame manner; and ſo of all the reſt. 'Tis on this account that we propoſe to examine the Wounds of each Part in particular.

We ſhall deduce the Indications of Cure from the Structure of the Part, without deviating from the general Rules that have been formerly advanced; and we ſhall ſay nothing more of general Remedies, theſe having been ſufficiently particularized in the preceding Treatiſe.

Of Wounds on the Head.

A Bullet, or any other hard Body, which is driven by Fire-Arms, may ſtrike the Head, and only occaſion a Contuſion without a Wound; it may alſo make a Wound of more or leſs Extent.

A Contuſion that is made by the grazing of a Bullet and not by a direct Stroke, may affect only the ſoft Parts covering the Skull, eſpecially if it happens to be on a Part that is covered with tolerable thick Muſcles, ſuch as the Temporal, or thoſe which cover the moſt inferior part of the Occiput.

A Contuſion made upon the Temporal Muſcle, may be ſuſceptible of very bad Symptoms, and conſequently is extremely dangerous, not on account of the Muſcle itſelf, but of the *Pericranium* which is ſtretched over it. This Covering craves a great deal of Attention, not only on account of it's being a tendinous *Aponeuroſis* which is tightly braced upon the Part even in a natural State, but alſo becauſe of it's cloſe Texture, which does not eaſily allow the Diſcuſſion of ſuch Fluids as may be effuſed under it. This Contuſion is frequently followed with an œdematous *Eryſipelas* which ſpreads over all the Head and Face; and we have often in this Caſe ſeen a number of Patients carryed off, by Symptoms of a like Nature with thoſe which accompany a Commotion of the Brain. The Surgeon therefore ſhould be directed in his Conduct according to the Appearance and Progreſs of theſe Symptoms. If none of theſe caſt up, the Application of topical Adſtringents, that is, Defenſives, will ſuit very well for the firſt Dreſſing here, as in all ſimple Contuſions, to keep up the Spring of the Veſſels, and to diſperſe the *Ecchymoſis* on the Circumference of the Part. In the ſecond Dreſſing we ſhould uſe Diſcutients to procure a Diſperſion of what remains. But if, in ſpite of theſe Endeavours, the Part ſwells, we may expect in a little time to find the *Eryſipelas*, Inflammation and Tenſion of the *Pericranium* bring on the Symptoms we have been ſpeaking of; ſo without farther Delay, we ſhould unbridle that Membrane by making ſufficient Scarifications. After this it ſhould be treated as a ſimple Wound, which we expect to heal up by regular Dreſſings.

A Contuſion of any part of the Head which is not covered by thick Muſcles, has nothing more particular, than what we have ſaid already in the firſt Part of this Treatiſe; but we very ſeldom meet with Contuſions here that are ſimple; and we have frequently obſerved the Symptoms of Extravaſation upon the *Dura Mater*, come on within two Weeks after a Blow, where the Bullet only grazed, and where the Hurt was ſeemingly ſo trifling, that even the Skin has not been torn. The Surgeon ſhould therefore ſuſpend his Judgment, and keep an attentive Eye on the leaſt Symptoms that may come on, and indicate an Extravaſation.

If the Bullet has ſtruck in a direct Line, the Bone is undoubtedly injured, however ſlight the Contuſion may be; and ſtill more certainly ſo, if the Contuſion be conſiderable.

ble. So, not to dally with Repellents or Diſcutients, proper Inciſions muſt be made, in order to examine the Condition of the Bone. If by the Inciſion we find the *Pericranium* ſeparated from the Skull, and the Bone conſequently laid bare, it is undoubtedly contuſed; the Operation of the Trepan becomes then as neceſſary, as in the Caſe of a Fracture; for by neglecting it, a Suppuration will be formed on the *Dura Mater*, which by any means ſhould be prevented. Who knows but the inner Table of the Skull may be fractured? Beſides, it is very poſſible that the Bone may be fractured even when there is no Wound on the Teguments, as has happen'd in a great many Inſtances; and this is an additional Reaſon which ſhould perſuade us to make the Inciſion as I have propoſed, in every Caſe where the Stroke has been in a direct Line.

Wounds of the Head, in the ſame manner as the different ſorts of Contuſion upon this Part, may either not reach ſo deep as the Skull, or they may likewiſe affect it with the Integuments.

A ſlight Wound upon the Temporal Muſcle is as dangerous as a Contuſion upon the ſame Place, on account of the *Pericranium* that covers it: I rank it among the tendinous Parts which require to be ſufficiently unbridled and dilated, as well in order to prevent the Inflammation they are obnoxious to, as to facilitate the Evacuation of thoſe Fluids which are effuſed under them. A Wound upon any other Part beſides the Crotaphite Muſcle, even when the Skull is not injured, may be attended with troubleſom Symptoms, if the *Aponeuroſis* of the Frontal and Occipital Muſcles has been contuſed.

All Wounds that affect the Skull are of the utmoſt Importance, though they may often appear inſignificant. Here might be a fit Place, for running through all the different kinds of Fracture on the Skull, to ſpeak of the Method of applying the Trepan, and of the Dreſſings; but as theſe Subjects have already been amply treated, in various Books upon the Chirurgical Operations, we ſhall refer the Reader to them, and content ourſelves at preſent with making ſome Reflections that will be uſeful in Practice.

Firſt. The Trepan is not, of itſelf, a dangerous Operation, if it be done in a proper manner; and when it is performed betimes, the Patient commonly will recover, if he has ſuffered no Commotion, if the *Dura Mater* be ſound, and if no Symptoms ariſe from a general bad habit of Body, or from the Indiſpoſition of ſome particular Part, which may cauſe Death independently of the Operation. We have even ſeen Patients recover, where there has been a Commotion of the Brain, and others where the Injury appeared full as dangerous, *the Dura Mater* having been torn. See my *Chirurg. Obſerv. Vol. I. Pag*. 12.

Second. Every Contuſion of the Skull requires the Trepan, becauſe it will be attended with a Diſorder of the *Dura Mater*. I have in a great many Inſtances obſerved this Membrane ſuppurate, after a Blow which was only bruiſing, where I had found the *Pericranium* ſeparated and the Bone ſenſibly diſcoloured. I have ſeen the ſame happen after a Blow from a ſharp Sword, which had only ſcooped out a Piece, as deep as the *Diploe*, the inner Table of the Skull having remained intire without any Fracture. See my *Chirurg. Obſerv. Vol.* I. *Pag*. 179. In this doctrine I agree with all the great Practitioners, and affirm that whenever a Bullet grazes upon the Head, ſo as to lay the Skull bare, there ought to be no Heſitation in apylying the Trepan, becauſe after ſuch Strokes we almoſt always have ſeen the *Dura Mater* ſuppurate at the injured Part, and in conſequence thereof, from the ninth to the fifteenth day of the Wound, the Patients have been ſeized with bad Symptoms, though during the firſt eight days they had all the Appearance of good Health. As thoſe Symptoms don't proceed in this Caſe from the extravaſated Blood, but from the Suppuration of the *Dura Mater*, and as this Suppuration comes on gradually, it is not adviſable to apply the Trepan the firſt day, becauſe then we might find the *Dura Mater* ſtill adhering to the piece of Bone that is encloſed by the Head of the Trepan. The beſt Time for applying it therefore, is the fourth or fifth day. Thus, proper Inciſions ſhould have been made, and the Skull laid ſufficiently bare, in the firſt Dreſſing, that we may be in Readineſs for trepaning, even before the bad Symptoms begin to appear.

Third. 'Tis commonly ſaid, that a large Fracture of the Skull is leſs dangerous than a very ſlight one, becauſe, ſay they, in the Caſe of a great Fracture, the Skull gave way to the Stroke, and by ſo doing, broke it's Force; and hence it is attended with little or no Commotion; whereas in that of a very ſlight Fracture, the Skull has reſiſted, and conſequently the whole Force of the Blow has been communicated to the Brain. This Reaſoning is not juſt, according to the Laws of Motion, except all Blows are ſuppoſed to be ſtruck with the ſame Degree of Force. Thus it holds not true with regard to ſmall Frac-

tures;

tures; for a Bullet that grazes, may occaſion a very ſlight Fracture, without any Commotion; and even one that ſtrikes in a perpendicular Direction to the Head, if it is near the End of it's Courſe, that is, what we call a dead Bullet, may occaſion a very ſmall Fracture, without giving a very ſenſible Commotion to the Brain. Neither does the former Suppoſition hold with regard to large Fractures, for the Body which gave the Stroke, may have been poſſeſt of ſuch Force as to make a very large Fracture, and at the ſame time communicate a very great Commotion. It is the Surgeon's buſineſs to examine all the Circumſtances, and to collate them with the State of the Wound. *Conſult my Reflections on the Wounds, Fractures and Contuſions of the Skull,* inſerted with my *Chirurg. Obſerv. Vol.* I *Pag.* 109.

Fourth. In every Fracture of the Skull, the *Dura Mater* ſhould be ſufficiently diſcloſed, either by the Operation of the Trepan, or by raiſing up one or more of the fractured Pieces; otherwiſe an Extravaſation will be made under the *Cranium*, in conſequence of a Rupture of ſome of the ſmall Veſſels which connect the *Dura Mater* to it, or of the *Dura Mater* itſelf being torn and bruiſed; or laſtly of the Contuſion of the Bone; for a Contuſion may happen even when the Fracture is very ſlight. 'Tis not for raiſing the fractured and depreſſed Pieces of Bone only, or for evacuating the extravaſated Blood, that the Trepan is applied; the Diſorder of the *Dura Mater* likewiſe often requires it.

Fifth. In Caſes where the Skull has ſuffered great Havock, as the *Dura Mater* ſuffers along the whole Extent of the ſhattered Part of the Skull, and even to the Extremity of every Fiſſure, we ſhould multiply our Trepaning, and apply one upon every Corner, where the State of the fractured Pieces does not render it unneceſſary or impracticable to raiſe them up. I have ſeen many Inſtances where the fractured Pieces of Bone have been raiſed out, and where on that account it was imagined the extravaſated Blood would be freely diſcharged, and proper Medicines would be conveniently enough introduced to the *Dura Mater*, and yet after all, the Patient has died, from a Suppuration on ſome Parts of the *Dura Mater*. Theſe Suppurations in ſuch Caſes were occaſioned becauſe the Trepan had not been applied upon ſimple Fiſſures, which communicated by one Extremity with the Part from which the fractured Pieces had been taken out, but at their other Termination were diſtant enough to require particular Attention.

Sixth. If the Bullet that fractured the Bone be not ſunk within the Skull, the Patient may recover. The Nature of the Fracture, which is either ſimple, or complicated with a Commotion of the Brain, muſt determine the Prognoſticks, and point out the Surgeon's Conduct, both with regard to the Application of general Remedies, and to the Operation which is neceſſary. But if the extraneous Body is ſunk and loſt within the Skull, the Wound is almoſt always mortal, becauſe of the Impoſſibility of extracting it. I ſhould ſay, that ſuch a Wound is always fatal, if we had not in our own Times ſeen a Perſon recover, who was Shot in the Head, and the Bullet, having run through the Skull, was lodged near the *Sella Turcica.* This Patient died ſuddenly about an Year after. We may find other Caſes of the ſame Nature; but theſe will not eſtabliſh a Rule; and ſerve only to teach us how Cautious we ſhould be in making a Prognoſtick.

Seventh. After various Wounds of the Trunk, or of the Extremities, we have ſometimes obſerved Symptoms caſt up, which had no kind of Relation to the Nature of theſe Wounds, and we have afterwards, but too late, diſcovered them to be the Conſequences of a Stroke which the Patient got upon his Head, by falling down when he was wounded. The Surgeon therefore ſhould guard againſt ſlighting ſuch things, becauſe they may take away the Life of a Patient who would otherwiſe have recovered, notwithſtanding his other Wound. The beſt Method of avoiding ſuch a Fault, is to examine the Patient's Head with great Attention.

Of Wounds with Fracture on the Frontal Sinuſes.

A Bullet may fracture the Skull upon the Frontal *Sinus*, and the Wound may affect only the external Table of the Bone, or it may injure both Tables.

If the Bullet breaks only the external Table, this Wound deviates not from the general Rule. I ſhall only obſerve, that when proper Dilatations have been made, and the Splinters taken out, we muſt in ſome Meaſure leave it to Nature; and that it is an eſſential Point, to uſe no greaſy Applications here; for theſe would occaſion a Luxuriancy of fungous Fleſh, on account of the copious Humidity which is inceſſantly poured out, from the numerous Glands ſpread over the inveſting Membrane of this Sinus. We ſhould therefore in place of theſe, uſe ſuch Medicines as are ſpirituous, deſiccative, and ſomewhat ſarcotick, either in Powder, or in a liquid Form. By this Means we may even prevent a Suppuration of the inveſting Membrane of the *Sinus*, and hinder the Bone's being expoſed, which might occaſion a fiſtulous Wound. I ſhall farther add, that an Extravaſation may be made upon the *Dura Mater*, though the inner Table be ſound; and therefore the Surgeon ſhould watch all the ſubſequent Symptoms, that he may trepan if they begin to appear. If the Trepan has been requiſite, the Dreſſings of the inſide of the Skull, ſhould be different from thoſe of the Wound on the *Sinus*.

If both Tables of the Bone are fractured, the Wound has nothing more particular than other Wounds with a Fracture of the Skull.

'Tis more difficult to apply a Trepan on the Frontal Sinuſes than elſewhere, on account of the Thickneſs of the Bone, it's two Tables being there ſeparated by the *Sinus*; and alſo becauſe of the Inequalities of the ſecond Table, which is very thick in ſome Places, and extremely thin in others.

Of Wounds with Fracture in the Orbit.

THE Orbit may be fractured, though the Eye be not wounded; or the Orbit and Eye may both have been injured.

When the Fracture of the Orbit is conſiderable, the Inflammation of the *Pericranium* which lines it's Cavity, may ſeize upon the Fat which lodges there, and partly fills up the Cavity, whence it will ſoon ſpread to the Globe of the Eye itſelf.

If Scarifications, Bleeding, proper Regimen, and the Uſe of ſuitable *Collyria*, do not aſſwage the Inflammation of the Ball of the Eye, an Abſceſs may be formed in ſome of it's internal Parts; and, ſuppoſing it ſo happened, we ſhould cut the Globe from one Side to the other, to give a Diſcharge, whenever we know ſufficiently by the Symptoms, that Matter is begun to form. This we know chiefly by the Swelling of the Globe, and the ſhooting Pains there, which the Patient complains of. If we wait in this Caſe, as we do in other Abſceſſes, till Pus be already formed, the Patient thereby riſques Blindneſs, by the Inflammation which will communicate itſelf to the other Eye, along the optick Nerve. If in conſequence of a Fracture in the Orbit, the Eye continues long diſordered, even without terminating in an Abſceſs, the Patient may loſe ſeeing with that Eye, or may have it's Sight much impaired.

Wounds of this, are not dreſſed like thoſe of other Parts; and we muſt here uſe ſuch Applications only as are ſpirituous

and

and gently Drying, by way of Lotions, ſuch as the Infuſion of Myrrh and Aloes, *&c.* If there be any Eſchars to ſeparate, they ſhould be touched with Spirit of Turpentine, which is almoſt the only Digeſtive that agrees with this Caſe. If the Body of the Eye be deſtroyed by the Bullet, we are to uſe the ſame kind of Dreſſings. When the greateſt part of an Orbit is deſtroyed, the Eye is then prodigiouſly diſordered, and the Patient is in Danger of loſing the Sight in the other Eye, if general Remedies ſtop not the Inflammation from ſpreading to it.

Of Wounds of the Jaws,

WHEN a Gun-Shot Bullet pierces the Body of the upper Jaw, it may remain here locked among the broken Pieces of Bone, or it may paſs quite through.

If the Bullet remains in the bony Subſtance of the upper Jaw, in ſuch manner that we cannot diſcover it, and the Patient be happy enough to recover, the Wound may continue always fiſtulous.

If the Bullet has paſſed through the Bones of the upper Jaw, as far as the oppoſite Side to where it entered, but has not gone quite out, ſometimes it may be ſenſible to the Touch, by the Inequalities which the broken Pieces of Bone make, at the Place where the Bullet ſhould have made it's Eſcape outwards; in this Caſe a Counter-opening is requiſite for it's Extraction.

If the Bullet has pierced through and through, frequently there is no great Havock produced, becauſe of the Rapidity with which it was carried, together with the Softneſs of the reſiſting Bones: And we have obſerved ſome of the wounded in this manner, cured in a very ſhort time. If their Cure be tedious, it is becauſe the Inflammation ſpreads over all the inveſting Membranes of the bony Cells and Sinuſes. If that yields not to Bleeding and other ſuitable Remedies, the Patient will be carried off.

In ſome of theſe Wounds, the Inflammation of the temporal Muſcle, and of it's Tendon, may bring on Convulſions; which we muſt endeavour to prevent or appeaſe by general Remedies, and by emollient and diſcutient Pultices.

If the Wound communicates with the Mouth, the copious *Saliva*, which flows from all the ſalivary Ducts, is admitted into the Wound, and the Pus of the Wound flows reciprocally into the Mouth; thus the Patient will be troubled with the Taſte of Pus, and with an inſufferable nauſeous

Smell, if Care be not taken to prevent theſe, by frequent deterſive and ſpirituous Gargles, or by Injections often thrown into the Patient's Mouth, if he cannot gargle himſelf.

If one, or both Cheeks be pierced, and the Loſs of Subſtance conſiderable, the Wound may remain fiſtulous, in ſpite of all the Care which the Surgeon may have taken to bring it's Lips together, and thus to aſſiſt Nature, who of herſelf endeavours a Re-union. There are Caſes, where this *Fiſtula* may be cured by the Stitch of a Needle, after having revived the Lips of the Wound.

If the *Fiſtula* be only occaſioned by an opening of the ſalivary Duct, from which the *Saliva* flows inceſſantly, eſpecially when the Patient eats, the Surgeon ſhould manage the Affair ſo, according to the various Circumſtances, that the Wound may remain fiſtulous only towards the inſide of the Mouth; and labour by proper Methods to heal up the external Orifice.

When the lower Jaw is fractured, beſides the Treatment which we propoſed as neceſſary in the general Treatiſe, the fractured Pieces muſt be kept in a right Poſition, by the Chin-Sling, or ſome other proper Bandage. In Fractures of either Jaw, the broken Parts have ſometimes been ſufficiently kept in their Place, by tying the Teeth, that were ſtill fixed in their Sockets, together. Read my *Chirurg. Obſerv. Vol. I. Pag.* 9.

Of Wounds in the Tongue.

WE may ſay in general, that Wounds of the Tongue are eaſily enough cured, becauſe this being a muſcular Part, is leſs ſuſceptible of Swelling and Inflammation, than adipoſe Parts. It's Injuries however of this Kind, are not always free from Accidents, upon account of the Membranes which connect the muſcular Fibres, and eſpecially upon account of the denſe Texture of the Skin that encloſes the whole, and is the Organ of Taſte.

If the Tongue therefore begins to ſwell and indurate, the Skin which inveſts it, being incapable of giving way to the Swelling, will quickly bring on a Gangrene. Wherefore we ought betimes to make one or two longitudinal Scarifications, of a ſufficient Length and Depth into it's muſcular Subſtance, otherwiſe the Patient would be loſt in a very little time.

In Wounds of this Kind, great Care ſhould be taken, in finding out the extraneous Bodies, which are often much concealed, on account of the Structure of the

Mouth. Theſe Bodies are either the Bullet itſelf, a detached Piece of Bone from the Jaw, or a Tooth.

It is Nature that dreſſes theſe Wounds with her *Saliva*; and the deterſive Injections, which the Surgeon applies, ſerve only to keep the Wound and Mouth clean; for their Stay there, is not of ſufficient Duration to procure any other Effect. In the mean time the Surgeon ſhould treat the external Wound, either where the Bullet entered, or where it paſſed out, in the Method which we have formerly explained.

Of Wounds in the Neck.

SUperficial Wounds of the Neck are of the ſame Nature with all other external Wounds; and therefore we ſhall not ſpend any Time about them.

Deep Wounds here, whether the Bullet remains, or if it be paſſed out, are more or leſs dangerous, according to the Nature of the wounded Parts, and Depth of their Situation.

The Inciſions which we have propoſed in the general Treatiſe, can never take Place here, except with regard to the external Wound. The wounded Parts that have a deep Situation, ſuch as, for Example, the *Larynx*, Wind-Pipe, *Pharynx*, Gullet, *Os Hyoides*, and all the Fat which ſurrounds the Muſcles and Veſſels of that Part, will, conſidering the Difficulty of making proper Inciſions, be in Danger of an inflammatory Swelling, which will degenerate into a Quinſey. If that happens, even after all the general Remedies have been applied, nothing can appeaſe it however but the repeated Uſe of thoſe Remedies, with the Aſſiſtance of emollient and diſcutient Pultices.

Here, as indeed in all other Caſes, it were to be wiſhed we could take out the Bullet; but if it be hid in the Subſtance of the Part, it's Extraction becomes difficult, except we run the Riſk of raiſing Inflammation, which is already too much our Apprehenſion, or of opening ſome Veſſel that would bring on a Hæmorrhage, which we ſhould hardly be able to ſtop. All that can be done, after the external Inciſions are made, is to aſſiſt Nature with emollient Pultices often renewed, and the Application of ſuch Medicines as will bring on a ſpeedy Separation of the Eſchar, without raiſing a plentiful Suppuration; for that might occaſion ſuch a Fuſion of the Matter, as would lay the *Larynx*, Blood-Veſſels and Muſcles all bare.

The Abundance of Blood-Veſſels, which are tranſmitted along the Neck, renders theſe Wounds full of Danger, both at firſt, and afterwards in the Progreſs of their Cure: At firſt, becauſe if any conſiderable Blood-Veſſel has been opened, the Patient dies immediately: Afterwards during the Courſe of Dreſſing, on Account of the Hæmorrhages which may ſurprize us every Moment. In theſe Sorts of Wounds, where the Separation of the Eſchar may cauſe a Hæmorrhage, the Surgeon ſhould hardly ever leave the Patient, becauſe we cannot keep a Tourniquet applied here, as upon the Extremities, ready to be ſcrewed tight, if the Bleeding ſhould appear. If then a Hæmorrhage breaks out, we muſt endeavour to find the preciſe Point, whence the Blood iſſues, and, if poſſible, make a Ligature upon the Veſſel. The Application of Stipticks is more uſeleſs here than elſewhere, on Account of the Impoſſibility there is of making an exact Compreſſion, to keep them on the Orifice of the bleeding Veſſel.

However, if the Ligature be abſolutely impracticable, we muſt, as was formerly directed, apply upon the Mouth of the Veſſel a ſmall Button expreſſed from *Rabel's* Eſſence, and ſupport it on that Part by the Finger, for half a Quarter of an Hour, or ſo; after which the Wound may be dreſſed, without the Neceſſity of making farther Compreſſion.

Of Wounds upon the Clavicle.

IF the Clavicle be fractured towards the *Acromium* by a Gun-Shot, the Wound deviates not from the general Rule. If the Fracture is towards the *Sternum*, the Breaſt may be opened; and if at the ſame Time the ſubclavian Artery or Vein be lacerated, as commonly happens, the Blood will be effuſed into the Breaſt, at leaſt if the Lungs are not adhering to the *Pleura* and *Mediaſtinum* at their upper Part. Here, as in other Caſes, we muſt ſtay the Hæmorrhage, by the Means which have already been recommended in general. Farther, as this has nothing more particular than other Wounds, whether the Blood be poured into the Cavity of the Breaſt, or not; ſo we cannot preſcribe a particular Rule for it's Treatment.

In both of theſe Caſes, when the Period of the capital Symptoms is over, we muſt think of keeping the Shoulder back with a Bandage, leſt the Arm ſink in towards the Breaſt, when it is deprived of it's ordinary Support from the Clavicle.

Of Wounds on the Scapula.

THE *Scapula* or Shoulder-Blade may be fractured in it's Body, or in it's Spine; and the Bullet may be lodged among

mong the ſurrounding Muſcles of this Bone, or it may have pierced farther.

If the Bullet, from an oblique Shot, has broke only the Spine of the *Scapula*, we have no Reaſon to be apprehenſive of bad Symptoms from this Wound, provided the Surgeon takes Care to do whatever our Art preſcribes. Farther than this, the Wound deviates not from the general Rule.

If the Bullet has pierced through the Body of the *Scapula*, probably ſome Bits of Bone, or Pieces of Cloth which the Bullet introduced with itſelf, are lodged betwixt this Bone and the Ribs. When there is an Occaſion of Dreſſing we ſhould make bold Inciſions, to diſcover the perforated Part of the *Scapula*. For this is one of thoſe Parts that are covered with thick Muſcles, where on that Account we can make any neceſſary Dilatation, without Danger. If any large Splinters be ſeparated, as ſeldom happens however, it is proper to extract them, in order to enlarge the Bullet's Paſſage; if there be only ſmall ones, the Hole itſelf is then ſmall, and it is ſometimes convenient to make it larger, either with the Trepan, or cutting Forceps, upon Suppoſition that the Bullet, or ſome other extraneous Bodies, are undoubtedly introduced and lodged about the *ſubſcapularis* Muſcle.

If, from a Neglect of extracting the foreign Subſtances, an Abſceſs be formed under the *Scapula*, which has no Diſcharge by the Wound, the Pus will ſpread out under the *Latiſſimus Dorſi* Muſcle, and there a Fluctuation will become ſenſible. In this Caſe a large Counter-Opening muſt be made, otherwiſe the Pus would lay all that Muſcle bare, and deſtroy all it's Connexion with the Ribs.

If the Bullet which pierced the *Scapula* has run into the Breaſt, the Inciſions and Enlargement of the Hole in the *Scapula* are ſtill the more neceſſary, eſpecially if a Rib be fractured. In this Caſe an *Emphyſema* is much to be dreaded; and the Dilatations which I have recommended will prevent it.

Wounds with a Fracture of the *Scapula* upon that Part whereby it is articulated with the *Humerus*, require the ſame Method of Treatment which we ſhall afterwards direct for the Wounds of the Articulations. I ſhall only obſerve here, that particular Care muſt be taken to ſupport the Arm with a Bandage which may bear up the Elbow ſufficiently; for without this Precaution, the Weight of the hanging Arm would haraſs the Wound a good deal, by the ſtretching, which it would occaſion, of the capſular Ligament and Muſcles, which are it's natural Support.

Of Wounds in the Breaſt.

A GUN-SHOT received upon the Breaſt may occaſion no Wound, but only a ſimple Contuſion; or, a very conſiderable Contuſion, accompanied with a Fracture of one or more Ribs. The Method of Cure muſt be determined according to the Degree of Contuſion. If there be only a ſimple *Ecchymoſis*, or if that *Ecchymoſis* be complicated with a fractured Rib, this Caſe deviates not from the general Rule.

Superficial Wounds of the Breaſt have nothing more particular with regard to their Cure, than what we have propoſed in the general Treatiſe. I ſhall only make one Remark here, which is of great Importance. As there is a conſiderable cellular Subſtance interpoſed betwixt the Ribs and the great fleſhy Muſcles, ſuch as the *Pectoralis Major* and *Latiſſimus Dorſi*, a great Fuſion of Matter is to be feared there, which may be encreaſed by the Application of ſuch Digeſtives as tend to promote Suppuration. If this happens, we may ſometimes prevent the complete Diſſection of theſe Muſcles, by making proper Counter-Openings.

One or more Ribs may be fractured by a Bullet, which, being ſhot in an oblique Direction, did not penetrate the Breaſt, but ſeemed to have paſſed under the common Teguments only. The Fracture of a Rib can neither be known by the Difficulty of breathing, nor by the Pain which the Patient complains of; but from the Direction of the Shot, from a crackling Noiſe which is ſometimes perceivable by the Ear and Touch, and from the pricking Pain which the Patient feels. In this Caſe, the *Pleura* has ſuffered only a leſs or greater Laceration, and an *Emphyſema* may come on ſoon after. It is not enough to enlarge the two Orifices of the Bullet, by Inciſions; but if we would prevent a great Number of Accidents, which the Fracture may give riſe to, we ſhould, without farther Heſitation, lay that Place open, where the Rib is fractured. By this Method, the *Emphyſema* will be prevented; by this Method Abſceſſes will be avoided, the Pus of which would be poured into the Breaſt, and ſeparate the *Pleura* from the Ribs; by this Method we facilitate the Extraction of bony Splinters, which might occaſion Abſceſſes, if left in the Wound; and we have an Opportunity likewiſe of taking out the Pieces of Cloth, which may have remained entangled upon the Inequalities of the Rib. Beſides, if the Lungs were in Adheſion with the *Pleura* at that Place, we will by this Method prevent their Inflammation and Suppuration.

When the Shot penetrates into the Cavity of the Breaſt, and the extraneous Body is either loſt there, or paſſes quite through, a Rib may be broke on the Side where the Bullet came in, or on the Side whence the Bullet fled out; and this Acident may likewiſe happen to each of the Sides at the ſame Time. Laſtly, there may be an Extravaſation of Blood, or there may be none. The Fracture of the Rib, the Injury inflicted on the internal Parts, and the Effuſion of Blood, when ſuch an Accident is produced, deſerve, each of them, particular Attention.

The external Wounds, or Orifices, require proper Inciſions, eſpecially that where the Bullet entered, if a Rib be fractured; becauſe here the Points of the Bone are turned inwards. Suppoſing the Situation of this Wound be low enough, it may facilitate the Diſcharge of whatever may be effuſed upon the Diaphragm.

With regard to the internal Wound, if the foreign Body is gone, having pierced through and through, we can lay down no Direction, but to prevent Inflammation by the common Remedies, and throw the Care of Re-union upon Nature (*a*).

If the Effuſion of Blood, or Pus, when this is formed, cannot be evacuated by the Wound itſelf, after we have dilated it, an artificial Counter-Opening muſt be made; this is what we commonly name the Operation of the *Empyema.* I ſhall ſay nothing about the Manner of performing it, as it is a well known Operation, of which many Authors have wrote; but I think myſelf obliged to offer ſome Reflections on the proper Time for making that Operation, and upon the Method of Dreſſing.

If the Effuſion be Blood, and if that flows from an opened intercoſtal Artery, we muſt begin by making a Ligature upon the Artery, and thus block up the Fountain whence the Blood ſtreams. Then the *Empyema* may be next performed. If the effuſed Blood ſprings not from the intercoſtal Artery, probably it comes from ſome internal Veſſel that has been opened by the extraneous Body; and though we know the Place where the opened Veſſel lyes, there is no poſſible Method of introducing the ordinary Helps, which Surgery directs for ſtopping Hæmorrhages. In the mean

---

(*a*) Manget. de Vuln. Aph. 5, 6.

time, before we think of evacuating what is already effuſed, we muſt firſt dry up the Source: Let us ſee then if the effuſed Blood itſelf be able to effect this Point.

We know, the Blood which flows from an opened Veſſel, forms a little Clod near the Mouth of that Veſſel; and if that Clod be encreaſed ſo as to come nearer and nearer, and at length into the Mouth of the Veſſel, the Bleeding will be leſs; but at laſt when the Clod becomes glued to the Inſide of that Orifice all round, the Bleeding will be entirely ſtopt. Farther, we know the Hæmorrhage will return, if this Clod ſeparates ſuddenly from the Veſſel. Mr. *Petit* is the firſt who has ſpoken of the Formation of that Clod, and has managed the Subject with a great deal of Erudition. Read the *Mem. of the Roy. Acad. of Sciences* for the Years 1732, 1733 and the following.

Upon this Principle I ſay, that except the Difficulty of breathing, occaſioned by the effuſed Blood, be inſupportable, we muſt not be too forward in evacuating that Effuſion; and when we can no longer diſpenſe with it, we muſt take off ſo much only, as will give the Patient ſome Eaſe, leſt the Clod or Plug ſhould be ſeparated from the Veſſel, either by it's own Weight, or by the Motion which neceſſarily attends Reſpiration. The ſame Reaſon which induces us to delay the Operation of the *Empyema* till a certain Period, and when we come to it, not to make a complete Evacuation of the Effuſion, ſhould ſerve as a Rule both for the Times of Dreſſing, and for allowing only Part of the effuſed Blood to run out at each Time.

When at length the Difficulty of Breathing does not encreaſe for the Space of ſeveral Days Interval between the Dreſſings, it is a Proof that the bleeding Veſſel is now ſtopt up. Then all the effuſed Blood changes into Pus, and we obſerve it gradually loſing it's red Colour, as it is diſcharged from the Breaſt. In a ſhort Time after, the Eſchars, and all the Clod of Blood which is not within the Veſſel's Mouth, ſeparate and come away inſenſibly.

Frequent Dreſſings would then be hurtful; and it is almoſt always enough to dreſs once in two Days, with a View to give Time for the Maturation of Pus, and not to be apprehenſive that the *Pleura* or Surface of the Lungs will be vitiated by the contained Matter.

We ſhould always take particular Care to hinder the Admiſſion of Air into the Cavity of the Breaſt, both at the Time, and during the Interval of Dreſſings.

Some Practitioners in Surgery make Uſe of a narrow Linen-Rag in Dreſſing, ſomewhat like a Seton, one End of which they introduce by the Wound, into the Breaſt. I cannot ſee how any Advantage can be reaped from ſuch Practice; but rather the contrary: For, we not only run a Riſk, in introducing it, of ſeparating the *Pleura* from the Inſide of the Ribs, or at leaſt of diſturbing that Membrane, but farther, that Seton in the Breaſt is truly an extraneous Body. Wherefore we ſhould uſe nothing but a Stopple of Lint, wrapt up in a Piece of fine Linen, and kept firm by a ſticking Plaiſter laid over, which will confine the Stopple in the Orifice of the Breaſt, and at the ſame Time hinder the Admiſſion of Air, when the Patient draws in Breath. This Stopple being pretty ſoft, ſhapes itſelf to the Figure of the Wound, and intermediate void Space of the two Ribs. The remaining Part of the Dreſſing has nothing particular in it.

I ſhall now offer my Reaſons, why I have not ſpoke of Injections into the Breaſt. The Dilatation of the Lungs is barely a paſſive Motion, with regard to the Lungs themſelves; and if this *Viſcus*, in Inſpiration, is dilated to receive Air into it's Cavity, it happens ſo, becauſe the Lungs are under a Neceſſity of keeping Pace with the Motion of the Breaſt, which at this Time has it's Capacity every Way enlarged.

ed. Conſequently, if there is a Wound of one Side or other, which penetrates the Breaſt; when the Cheſt is dilated, the Air ruſhes in by the Wound, betwixt the *Pleura* and Lobe of the Lungs which fills that Side, whence this Lobe is not dilated.

This being granted, ſuppoſe a penetrating Gun-Shot Wound of the Cheſt, I ſay Injections into the Cavity are not only uſeleſs in this Caſe, but even hurtful. For while we are throwing in the Liquor, and making it run out again, the Dilatation of the Cheſt is in vain, the Air ruſhes not into the Lungs of this Side, but only betwixt the *Pleura* and external Surface of the Lungs. Wherefore this Side of the Lungs remaining inactive during the whole Time that is ſpent in ſuch Dreſſings, the Circulation of the Blood is there impeded, which may cauſe new Surcharges, and produce a new Series of Diſorders. Theſe are my Reaſons for prohibiting the Uſe of Injections, which always require a deal of Time.

In the Cure of all Wounds inflicted on the Breaſt, whether they penetrate, or not, whether the Lungs be wounded, or not, whether there is, or is not a Hæmorrhage, we ſhould by Means of a pretty tight Bandage, in ſome Meaſure check Reſpiration; that is, hinder the Cheſt from dilating ſo much as it would naturally do, becauſe the

Wound

Wound itſelf will neceſſarily be dilated in every Inſpiration, proportionably to the Dilatation of the Cheſt.

Of Wounds in the Lungs.

WHEN a Bullet has pierced the Lungs, and paſſed out again, the Patient may recover, as we have ſeen happen in many Inſtances; 'tis Nature alone that muſt cure the Wound here, as well as thoſe of the other *Viſcera*; and in order to promote her Operation, the Surgeon ſhould prevent or appeaſe the Inflammation, as was formerly ſaid *(a)*. But if the Bullet has penetrated a conſiderable way into the Lungs, and reſts there, probably the Patient will die, becauſe we can have no Hopes of extracting it. There is only one Caſe where this may be done, or indeed where we ſhould attempt it's Extraction; I mean, when the Lungs adhere to the *Pleura* at the wounded Part, and when at the ſame time the Bullet can be felt by the round ſmooth End of a large Sound. The Eſchar, which is along the whole Paſſage, allows of introducing the Sound ſo far, without any Danger of irritating the Lungs; and perhaps it will likewiſe allow of ſeizing the Bullet with a Scoop, or Pair of Forceps; becauſe that Eſchar is a Wall of Defence, without any Senſe of Feeling: and ſuppoſe the Operation, which I recommend, cauſes ſome Degree of Irritation, yet ſtill it will do leſs harm, than the Bullet would do by remaining in the Lungs. In this Caſe it is neceſſary the external Wound be ſufficiently dilated, that the Surgeon may proceed with Eaſe, and meet with no Obſtacle in his Operation.

(a) Manget. Centur. 2. Aph. 77.

With regard to the Dreſſings, the Surgeon muſt not here, as in Wounds of the external Parts, introduce ſuch topical Medicines as will promote the Separation of the Eſchar, and deſtroy or correct the falſe Fleſh which may ſhoot up. It is true indeed, when the Lungs are in Adheſion with the *Pleura*, and the Eſchar ſtill ſubſiſts, proper Injections may be uſed, without any Fear of their being effuſed upon the Diaphragm; but when the Eſchar is fallen, theſe Injections would excite the Patient to cough, and thereby cauſe a dangerous Irritation. Wherefore, at this Time, we muſt be ſatisfied with pouring in a few Drops of ſome ſuitable Balſam.

Of Wounds in the Mediaſtinum.

GUN-Shot Wounds that affect the *Mediaſtinum* are extremely dangerous, becauſe this Part is of a membranous Texture, and very much ſubject to Inflammation.

As this Membrane is ſtretched out in the Middle of the Breaſt, connected to the *Sternum* forwards, and to the *Vertebræ* of the Back on the poſterior Part, it's Inflammation cauſes exquiſite Pain, and great Difficulty of breathing. Our Art can do nothing towards the Cure of theſe Wounds, except by applying ſuch general Remedies, as we have already pointed out in the general Treatiſe.

If an Abſceſs be formed in the Duplicature of this Membrane, in conſequence of Inflammation, (and we may know that it is forming, by the common Symptoms of a Suppuration ; or that it is already formed, if the Oppreſſion encreaſes even while the Fever declines) I ſay, if an Abſceſs is formed here, it will be a difficult Matter to evacuate the Pus. If we can judge from the Situation of the Pain, or œdematous Swelling upon the *Sternum*, that the Collection of Pus is immediately under, we may apply a Trepan upon that Bone in order to procure a Diſcharge of the Pus: But if favourable Circumſtances do not concur towards this Operation, the Abſceſs will open into the Breaſt, produce an *Empyema*, and kill the Patient in ſpite of all we can do.

Of Wounds in the Heart.

WOunds of the Heart are all fatal: And if the Patient expires not immediately, by an Opening made into one or other of it's Ventricles, he will die ſoon after by the Inflammation of this *Viſcus*. We have met with a few Inſtances of Perſons living ſome Days after a Wound inflicted by a Sword, which pierced only into the Subſtance of the fleſhy Fibres that compoſe the Heart; but if the Wound be Gun-Shot, the Patient's Death will be more ſudden, on Account of the Shock and Perturbation which neceſſarily attends ſuch a Wound.

Of a Wound in the Diaphragm.

A Wound in the Diaphragm may either affect it's middle tendinous Portion, or it's outer fleſhy Part. Both theſe Wounds admit of Cure with great Difficulty, not only becauſe the Diaphragm cannot be pierced by a Bullet, except ſome of the other *Viſcera* be alſo wounded, but likewiſe becauſe of the conſtant Motion to which this Part is ſubjected; for we know that Reſt is neceſſary to the Formation of a *Cicatrix* upon any Part. If any of theſe Wounds may be cured, it is ſuch as are made in the fleſhy Part: For thoſe which affect the middle tendinous Portion are always mortal; they bring on very ſudden Convulſions, and even a *Delirium*.

Theſe Wounds frequently occaſion a *Hernia* of ſome of the Parts that are contained in the Belly, whether of the Cawl or Inteſtines, Part of which is puſhed up into the Breaſt. The Surgeon's Hand can be of no Service here with relation to any Operation; and nothing but Nature herſelf, aſſiſted with general Remedies, is able to cure Wounds of this Nature. Wherefore I can give no farther Directions than what have been laid down in the general Treatiſe.

Of Wounds in the Sternum.

THE *Sternum* or Breaſt-Bone may be fractured by a Shot, when there is no Wound, but only a ſtrong Contuſion of the Integuments; or it may be fractured and laid bare when the Teguments are wounded.

A conſiderable Contuſion upon the *Sternum*, even though complicated with a Fracture, deviates not from the general Rule. The Inciſions that have been always directed, may be more requiſite here than elſewhere, with a View to diſcharge the ſoft Parts of their Load of Fluids, and to prevent ſpreading Suppurations among the inveſting Fat and Membranes of this Part. For by theſe Suppurations the fractured Bone might be laid bare, and at length become carious. *Ambroſe Paré*, Book II. Chap. 6. ſpeaks of this Accident, but orders no Inciſions for preventing it. However, theſe are undoubtedly the beſt Means for this Purpoſe. After the neceſſary Inciſions are made, Nature will reunite the divided Parts, if ſhe be favoured with Reſt in the Part. With regard to the internal Contuſion, which is almoſt inſeparable from a Contuſion on the outſide, there is nothing but Application of general Means, that can obviate the Formation of Abſceſſes in the cellular Subſtance that connects the *Pleura* with the *Sternum*, or in the Duplicature of the *Mediaſtinum*.

When there is a Wound with Fracture, and when the *Sternum* is expoſed, the ſame Method of Practice nearly muſt be obſerved as in Fractures of the Skull; that is, if there be any Splinters, or Pieces diſplaced and ſeparated from the Bone, they muſt be taken out; or if ſuch Pieces are ſunk in, and depreſſed, they muſt be raiſed, even by applying the Trepan for facilitating this Work, if it cannot be accompliſhed by other Means.

In the Caſe of a ſimple Contuſion, as well as in that of a Fracture, an Abſceſs may be formed betwixt the *Pleura* and *Sternum*; this Misfortune will diſcover itſelf by the characteriſtick Signs which I have formerly laid down, in treating of Wounds in the *Mediaſtinum*, and the Surgeon muſt examine the Circumſtances with great Attention, that he may give a Diſcharge to the Pus by putting on a Trepan.

If the *Sternum* becomes carious during the Treatment, there ſeldom happens a ſenſible Exfoliation; we muſt extirpate all the vitiated Part with a Raſpatory, exfoliating Trepan, or Chiſel; and as the *Sternum* is of a ſoft ſpongy Texture, whatever we thus expoſe will be covered over and heal, provided we apply only ſpirituous or drying topical Medicines, and avoid every Thing that is greaſy or promotes Pus.

Of Wounds in the Spine.

WOunds inflicted on the Body of the Spine or Back Bone, wherever they be, betwixt the firſt *Vertebra* of the Neck and *Os ſacrum*, are all mortal, if at the ſame Time the ſpinal Marrow has been lacerated; for every Part that is furniſhed with Nerves from the ſpinal Marrow muſt ſympathize with it, in every Injury: And of conſequence, the Patients turn paralytick in all the Parts that are lower than the Wound. A Commotion alone of the Spine, occaſioned by a ſimple bruiſing Stroke, may be productive of the ſame Accident.

The tranſverſe and ſpinal Proceſſes may be fractured, and the Body of the Spine not injured; and even when the vertebral Artery is divided, theſe Wounds are included in the general Rule: Wherefore I ſhall not deſcend to Particulars, but only obſerve, that in making the requiſite Inciſions, we muſt not ſpare the Tendons which are very numerous here, but cut them quite through without regard.

Of Wounds in the lower Belly.

WE ſeldom meet with a conſiderable Contuſion upon the lower Belly, without a Wound at the ſame Time, becauſe this Region being ſoft almoſt in it's whole Circumference, any hard Body, either of a ſpherical or angular Form, that ſtrikes it with the ordinary Force communicated by Gun-Powder, muſt unavoidably pierce it. If ever a great Contuſion therefore happens in this Place without a Wound, it muſt have been produced by a Blow from ſome flat or broad ſurfaced Body, which indeed may ſometimes fall out. In this Caſe the external Contuſion demands not the Surgeon's Attention ſo much, as the Injury of the internal Parts, which have certainly ſuffered. The Surgeon's Attention, which I have juſt mentioned, ſhould conſiſt in preſcribing a Regimen the more reſtricted, as the *Viſcera* that ſerve Digeſtion and Diſtribution of the Chyle, are now contuſed: This Attention muſt conſiſt alſo in Bleeding the Patient, according to the Exigency of Circumſtances; in giving vulnerary Drinks; and in applying diſcutient Fomentations over his whole Belly often; in one Word, every Thing muſt be adminiſtred that can prevent a Surcharge upon the Part, and facilitate the Diſperſion of extravaſated Fluids.

I ſhall ſay nothing of ſuch Gun-Shot Wounds as penetrate no farther than the Integuments of the *Abdomen*. Thoſe that pierce into it's Cavity, without wounding any of the *Viſcera*, even when the Bullet is loſt there, deviate not from the general Rule, and much leſs thoſe where the Bullet has run quite through. I may only obſerve, that a Rupture may be occaſioned by the Wound. When this is large, we almoſt always ſee a great Bundle of the Inteſtines or *Epiploon* fall out; and when the Wound is narrow, we often obſerve the Inteſtines intangle themſelves, during the Interval of Dreſſing, betwixt the *Peritonæum* and ſuch things as are ſtuffed in the Wound, which may expoſe the Patient to violent cholick Pains, till theſe Inteſtines be reduced again. The Stricture and Compreſſion that the Inteſtines labour under at this time, is Cauſe enough for ſuch Cholicks. Here, we have no occaſion for making a Suture; but after having dilated the Teguments, or even the *Peritonæum*, if the Inteſtine could not otherwiſe be reduced, in order to keep that up, we muſt introduce a large thick linen Sindon on the inſide of the *Peritonæum*, ſuſpended with a double Thread, ſuch as we put in the Skull after the Trepan; and laſt of all, keep it fixed there, with Lint and the other Dreſſings. *Mr. Dargeat* of the Brotherhood, and Senior Surgeon of the Army, told me he had practiſed this Method with great Succeſs.

Wounds that penetrate the lower Belly, and hurt ſome of the *Viſcera*, are very ſeldom cured, and that for many Reaſons. The firſt is, that as there is often a Swelling upon the external Parts wounded by a Gun-Shot, ſo there may alſo be on the internal Parts. The ſecond is the Impoſſibility of preventing or mitigating that Symptom here, by uſeful Inciſions, or the Application of ſuitable topical Medicines; whence it is that the Inflammation and Gangrene frequently carry off the Patient, about the ſeventh Day. The third Reaſon is the Impoſſibility we meet with in ſome Caſes of hindering the Diſcharge from being diffuſed into the Cavity; and this Diſcharge may either be the Pus of the Wound, the Aliment when the Stomach is penetrated, the Excrements when the Inteſtines are pierced, or the Urine when the Bladder is opened towards the *Abdomen*. Wherefore we may look upon the following Liſt as mortal; Wounds of the Stomach, of the ſmall Inteſtines, of the great Inteſtines, or of the Bladder, when theſe are opened towards the Cavity of the *Abdomen*; thoſe of the *Pancreas* and Liver, when this laſt is wounded on it's concave Side, though we have ſeen a few Inſtances of ſuch cured. With regard to thoſe of the large Blood-Veſſels, they are always fatal.

In all theſe Caſes, 'tis vain to hunt after the Bullet, if it be loſt in the Cavity: The principal Object of the Surgeon's Aim is to prevent the Inflammation of the wounded Parts, becauſe that will be prejudicial to the Efforts of Nature, which, as we formerly ſaid, muſt alone bring about the Cure of internal Wounds. With this view, we muſt have Recourſe to emollient and diſcutient Fomentations often renewed. Though the Wound of the Teguments be not the moſt dangerous Point, 'tis convenient however to enlarge it; but we muſt not dilate that of the *Peritonæum*, becauſe in ſo doing, we ſhould open a way for the Inteſtines to fall out, and produce a Rupture at the Wound. This Rule is not without Exception; for if the Wound be upon that convex Part of the Liver which is not in Contact with the Diaphragm, we muſt dilate the Orifice of the *Peritonæum*, as well as of the common Teguments; becauſe here we need be under no Apprehenſions of a Rupture, as in other Places: But we muſt not go farther, becauſe the Eſchar formed by the Bullet is of uſeful Efficacy in preventing a Hæmorrhage. If the Inciſion enables us to feel the Bullet, we muſt extract it, even though ſunk into the Subſtance of the Liver.

What I have ſaid of Wounds inflicted upon the convex Side of the Liver, is likewiſe applicable to the Wounds of ſuch Parts as lye not floating in the Cavity, but are attached to one fixed Place by the *Peritonæum*, or *Meſocolon*, and may be wounded, though the Bullet pierces not into the common Cavity of the *Abdomen*. The Spleen is one of theſe Parts, as well as the *Cæcum* and part of the *Colon*, the groſs Excrements of which may be diſcharged through the Wound. The ſame thing holds with regard to the Wound of a Kidney, ſuppoſing it to be on the back Part, or towards the Loins. As all theſe Parts are covered with thick fleſhy Muſcles, the external Wound muſt be dilated a good deal, even as deep as the *Peritonæum* incluſively.

Wounds that penetrate into the Subſtance of a Kidney, require a Method of Dreſſing peculiar to themſelves. As the Urine is conſtantly diſcharging itſelf by the Wound, 'tis proper to beſmear that with greaſy Medicines, and thereby defend it's Surface againſt the urinous Salt, which would otherwiſe occaſion very troubleſom Smartings, and indurate the fleſhy Sides.

Of penetrating Wounds in the Pelvis.

A Bullet may run into the *Pelvis* and be loſt there; or it may pierce quite through, from above downwards, in a horizontal Direction, or obliquely. The great Quantity of Veſſels ſituated in this Part, render theſe Wounds full of Danger; and if one of a conſiderable Size be opened, the Patient muſt die, on account of the Impoſſibility of conveying Aſſiſtance to the Seat of that Diſorder. The Eſchar, or even the clotted Blood may indeed ſtay the Hæmorrhage for ſome time: But then the Patient will be in a very dangeroes Condition, upon the Separation of that Eſchar or Clod of Blood. And beſides, the Bladder, as I have ſhewn (*a*), is ſurrounded with a very remarkable cellular Subſtance, that eaſily inflames; and if a ſpreading thin Suppuration comes on, it will be impoſſible to introduce the Means of Cure that Art points out, in ſuch a Caſe.

The Bladder may be perforated; and if it was diſtended with Urine at that time, there is no great Laceration, and the Wound is narrow; for this Reaſon, we have ſeen many ſuch heal up. We have even

---

(*a*) Parallele des differentes manières de tirer là Pierre hors de la Veſſie, *imprimé en* 1730.

met with Caſes where the Bullet and other extraneous Bodies remained in the Cavity of the Bladder, which comes near to a Proof that it was then full of Urine. In this Caſe, after having treated the external Wound in a proper Manner, it is not amiſs to introduce a Catheter by the *Urethra*, that the Urine may be conſtantly draining off; for a Diſtention of the Bladder will ſeparate it's Sides, and conſequently the Lips of the Wound; then the Urine may ooze out into the ſurrounding cellular Subſtance, and thereby give Riſe to Abſceſſes and other troubleſom Symptoms; whereas that cellular Subſtance being in a ſound Condition, contributes more than any thing towards a Re-union of the Bladder.

Some of the Patients with whom the extraneous Bodies remained in the Bladder, have paſſed them along the *Urethra* with their Urine, before they were cruſted over with Gravel; and others again have had the Stone, which has afterwards induced a Neceſſity of extracting it by the common Operation. And then theſe extraneous Subſtances, ſuch as a Bullet, a Rag of Cloth, *&c.* have been found to form the Kernel of the Stone.

The *Rectum* or Straight-Gut may be pierced: And if the Wound be higher than the Surgeon's Fingers can reach, it's

Treatment is the ſame as that of Wounds in the Bladder, with regard to the Inciſions, which can never penetrate this Length. If the Wound be towards it's Extremity, the Operation for a *Fiſtula* muſt ſometimes be made; at leaſt the requiſite Inciſions may be made on the ſurrounding Fat.

In the courſe of Dreſſings, two very eſſential Points are to be minded. The firſt is to preſerve the Diameter of the *Anus* as much as poſſible, by introducing a Suppoſitory perforated in form of a *Canula* or Pipe, as ſoon as the Orifice ſeems threatned with Conſtriction. The ſecond is to prevent a Looſeneſs that might diſturb the Condition of the Wound prodigiouſly, from whatever Cauſe it proceeded.

Of Wounds on the Oſſa Iliûm.

A Fracture from Gun-Shot of the *Os Iliûm* or Hanch Bone, is of the ſame Nature with that of the *Scapula*; as it is covered with thick Muſcles, the Inciſions ſhould not be inflicted ſparingly; and they ſhould be made as deep as the Fracture, to facilitate the Extraction of Splinters, or any Pieces of Bone that are looſe and diſplaced.

If the Bullet, after having made it's Way through the Bone, has not pierced very far into the *Pelvis*, but is ſtopt in the cellular

Membrane of the *Peritonæum*, or at the inner Surface of the Bone, betwixt that and the Muſcles which cover it internally; in ſhort, if it lyes not deep, which we can ſometimes diſcover by introducing the Sound or Finger, in order to accompliſh it's Extraction, we muſt inlarge the Orifice of the Bone with the exfoliating Trepan, Chiſel, or cutting Forceps.

In the Courſe of Dreſſing, fungous Fleſh is apt to riſe upon this, as on all other ſpongy Bones when fractured by a Gun-Shot; the Surgeon ſhould therefore obviate theſe Funguſes by the Application of drying Medicines; but if they are already riſen, he muſt take them off, and deſtroy their Roots, as we have directed in the firſt Part.

Fractures of this Bone heal almoſt always without any ſenſible Exfoliation, if Care has been taken to extract all the Splinters and looſe Portions of the Bone; but if any of theſe remain diſplaced, they render the Wound fiſtulous.

If the Bullet be loſt in the *Abdomen* or *Pelvis*, this Circumſtance does not free the Surgeon from obſerving the Rules that we have laid down, relating to the Fracture of the Bone.

Of Wounds on the Parts of Generation.

IF the *Penis* be contuſed by a Gun-Shot, this Contuſion is followed with an *Ecchymoſis*, and conſiderable Swelling, that reaches over the *Scrotum*. A Contuſion and *Ecchymoſis* of the *Scrotum* is communicated in the ſame manner to the *Penis*, and ſometimes reaches as high as the Belly, along the Spermatick Rope; and then Inflammation ſpeedily ſucceeds. In this Caſe a Gangrene may fall out ſoon after; and by way of Prevention, we muſt multiply the Inciſions in proportion as this Accident ſeems advancing.

When either of theſe Parts is wounded, the *Ecchymoſis* ſpreads in the ſame manner, and a Gangrene is ſtill more to be dreaded, becauſe the Wound is not ample enough to procure a ſufficient Evacuation. After the neceſſary Inciſions are inflicted, we muſt deal laviſhly in ſpirituous and diſcutient Fomentations, often repeated. If the *Penis* be ſo much ſwelled as to block up the urinary Paſſage, a Catheter muſt be introduced thereby into the Bladder.

If the end of the *Penis* has been ſhot off, we muſt put a *Canula* into the beginning of the urinary Canal, of a convenient Length and Thickneſs, to prevent not only the Orifice from being contracted in it's Diameter, but alſo from ſhrinking up and concealing itſelf amidſt the fleſhy Parts, as I have ſeen happen.

Of Wounds in the Joints.

WOUNDS that are inflicted upon, or near the Joints, where the capſular Ligament is not lacerated, deviate in nothing from the general Rule; and they are very often cured, by the Means that have been propoſed in the firſt Part of this Treatiſe.

Such Wounds as are of great Extent, even when the Joint is partly deſtroyed, by a little Portion of it being ſhot off, theſe, I ſay, are leſs ſubject to bad Accidents, than ſuch as only penetrate into the Joint, or even than a conſiderable Bruiſe occaſioned there; the Reaſon of which is as follows. In a violent Contuſion, as when a Bullet pierces through and through, the Commotion or Shock is communicated to the whole Articulation; the *Epiphyſes* may be ſeparated; the *Capſula*, Ligaments, Tendons, Synovial Fat and Glands are injured: But large Wounds have this Advantage, that their Suppuration, when it can be eſtabliſhed, is a ſalutary Fountain whereby we may expect an Evacuation or Drain from all the damaged Parts; whereas in narrow deep Wounds, and in a violent Contuſion, the Suppuration is ſcarcely ever kept up, but at the Expence of the whole Articulation, and even of the whole Limb. For, the Synovial Glands become replete, the Fat inflames and ſuppurates, the *Epiphyſes* are ſoaked and ſwell, the Bone turns carious, the *Capſulæ* and *Aponeuroſes* rot, and inflammatory thin Fuſions of Matter creep along the Muſcles that tranſmit their Tendons over the Joint, and thereby occaſion Abſceſſes all the length of the Limb.

I have, in the firſt Part, made a great Difference betwixt Wounds of fleſhy, and thoſe of tendinous Parts; and I have explained the Reaſon of theſe laſt being much more liable to bad Symptoms than the former. To ſhun Repetition therefore, I ſhall only obſerve with regard to Wounds of the Joints, that their Danger ariſes not from the Nature of the ſurrounding tendinous Parts alone, but alſo from the Structure of the Joint, which being of a conſiderable Thickneſs will not allow advantageous Inciſions to be made.

Upon this Principle, I will add, that a Wound wherein half of the Joint is ſhot off, muſt be conſidered as much leſs dangerous, than one which pierces ſimply through and through.

Though I look upon very large Wounds of the Joints as leſs dangerous than ſmall penetrating ones, that is, ſuch as paſs quite through from Side to Side, I would remark however, that generally all of them are ſubject to remarkable Accidents when the capſular Ligament is opened; and that very few of them are cured except by amputating the Limb; and that if there is any ſecure Method of obviating the bad Symptoms, it conſiſts in a ſpeedy Amputation above the wounded Joint. If the Circumſtances induce to attempt the Cure of the Wound without Amputation, the Surgeon ſhould make liberal Inciſions, and borrow all the Aſſiſtance he can, from ſuch general or particular Remedies as we have recommended above; he ſhould, as we likewiſe obſerved formerly, avoid in his Dreſſings, all Applications that are greaſy or promoters of Pus, and ſubſtitute in their place ſpirituous, vulnerary or drying Medicines alone (*a*). If he be happy enough to prevent, or ſtop the Progreſs of all the bad Symptoms that ſuch Wounds are liable to, yet ſtill he may with Reaſon be apprehenſive, that the greateſt Number of theſe Patients will die in the latter Part of the Treatment, by a *Maraſmus*, or *Diarrhœa*, the

---

(n) Ambr. Paré, *Plays d'Arqueb.* Ch. V. & ailleurs, *Plays des Jointures.*

ordinary Conſequences of long Suppurations: and therefore he ought to guard againſt theſe, by a ſuitable Regimen, by alkaline Cordials, and other Remedies appropriated to the different Circumſtances.

When theſe Wounds do not carry the Patient off, they may probably remain fiſtulous; and the Joint almoſt always continues void of Motion, that is, forms an *Anchyloſis*. With regard to the *Fiſtulæ*, as they are the Conſequence of a *Caries* in the Bone, or of ſome remaining Splinters that ought to come out, this muſt be the Work of Nature; and the Surgeon can ſeldom aſſiſt her much. In Relation to the *Anchyloſis*, as it is not occaſioned by the Petrification of the *Synovia*, but by a kind of ſtiff Drineſs of the Parts, in Conſequence of the *Cicatrix* and Deſtruction of the Synovial Glands, ſo we can only expect a Return of the Joint's Motion, by the Uſe of emollient Embrocations, by bathing and pumping in hot Water, during which Courſe we ſhould move the Articulation gently, and gradually force the ſtiffened Parts to obey the Motion.

Of Wounds in the Arm.

WOUNDS in the Arm, whether they be ſimple, or complicated with a Fracture of the *Humerus*, deviate not from the general Rule; wherefore I ſhall content myſelf with making ſome Reflections which the Structure of the Part leads me to.

Both in the time, and intervals of Dreſſing, when the Bone is fractured, care muſt be taken to keep the broken Pieces as much fixed and ſupported in their natural Place, as if no Fracture had happened. With this view, after having dreſſed the Wound in the manner we have recommended, the whole Circumference of the Part muſt be incloſed with two Plates of tinn'd Iron, Paſt-Board, or the Bark of Trees, ſhaped to the form of that Part, and tied on with pretty long Tapes. Theſe Plates or Splints being cloſely applied along the Member, keep it faſt, at the ſame time that they make no Compreſſion; they are no weighty Load, and they give Eaſe to the Patient, who would otherwiſe feel Pain in every Motion of his Body. In order to prevent the leaſt Motion of the wounded Part, we may make a Window or void Space in the Splints, and thereby dreſs the Wound, without being obliged to remove them. Theſe Splints are much more uſeful and commodious than the Bands with void Spaces in them, that *Maggius* recommends.

If the Entrance or Exit of the Bullet be near the brachial Artery, it may ſo happen,

pen, that the Bullet has bruiſed or lacerated that Veſſel, or ſome of it's larger Branches detached to the Muſcles, even though the Blood does not ſtream; becauſe the Contuſion is violent enough to Stop the Hæmorrhage. The Surgeon ought then to be upon his Guard againſt this Hæmorrhage, that may, and indeed naturally ſhould happen, when the Eſchar falls. Wherefore by way of Prevention, he ought to dreſs that Part of the Wound with dry Digeſtives only, which will give the opened Veſſel time to be cloſed up. But as the Hæmorrhage may burſt forth ſuddenly every Moment, whatever Precaution we take, it is requiſite to leave a Tourniquet on the upper Part of the Arm, applied only looſe, and ready to be made tight as ſoon as the Bleeding appears; which any Perſon preſent may do as well as the Surgeon himſelf. As this Ligature made by the Tourniquet ſerves only to procure Command of the Blood for a ſhort time, when the Surgeon is called, he ſhould lay the Veſſel bare, either by a proper Inciſion, or without any cutting Means, and tie the Artery as we have directed. If the Wound be in the Trunk of the Artery, he muſt nevertheleſs tie it, and be in Readineſs to amputate the Arm, if it ſhould be threatened with Gangrene, through Want of Nouriſhment.

During the Treatment of Wounds in the Arm, Care muſt be taken to keep the Fore-Arm half bended, on a double Account. The firſt is, becauſe in this Poſture the Flexor and Extenſor Muſcles are both relaxed. The ſecond is, that when the Cure is completed, the Motions of Flexion and Extenſion in the Fore-Arm will be difficult and confined for a long time, on account of the Scars that bridle and conſtrain the Action of the Flexor, or Extenſor Muſcles, according to the Situation of the Wound. If the Fore-Arm continues bended, the Patient may have the Uſe of his Hand, which he could not, had his Fore-Arm remained extended.

Of Wounds in the Fore-Arm.

GUN-Shot Wounds of the Fore-Arm, are more ſucceptible of bad Symptoms, than thoſe of the Arm. The Difference ariſes from this, that all the Muſcles ſituated upon the Fore-Arm, are conjointly wrapt up in a tendinous Membrane, that is, an *Aponeuroſis* or Expanſion detached from all the Flexor and Extenſor Muſcles; which Membrane dipping into the Interſtices of all the Muſcles of this Part, covers each of them likewiſe in Particulars. The Inflammation of this Membrane is therefore greatly to be feared, ſince in that State, it ſtrangles at once almoſt all theſe Muſcles; and beſides it may ſpread and communicate itſelf to the Arm likewiſe. When this enſues, we obſerve the whole Fore-Arm ſwell up in a greater or leſs degree, and ſometimes become ſo hard, that a Gangrene muſt ſpeedily ſucceed, if not prevented. On this account, the Inciſions that are made there, ſhould penetrate to the Bottom, and unbridle all the Parts, but chiefly the common tendinous Membrane, in every Direction, eſpecially when the *Radius* or *Cubitus* is fractured. Theſe Inciſions ſhould be backed with all kinds of topical Emollients, fit for relaxing the Skin and common Membrane, which is now extremely tenſe. If in ſpite of this, the Swelling continues, accompanied with Hardneſs, and encreaſes ſo as to threaten a ſudden Gangrene over the whole Part, Recourſe muſt be had without Delay to the Scarifications, of which we have ſpoken above.

When the Swelling that enſued, has not been violent enough to require theſe Scarifications, yet it's Exiſtence is ſufficient to expoſe the Fore-Arm to ſome Accident or other: And we ſometimes meet with Abſceſſes formed in different Places; Abſceſſes, diſtinct one from another, and that have no Communication with the Cavity of the Wound, becauſe of the various Partitions made by the common Membrane in the Interſtices of Muſcles. While the Pus is forming here, the Wound takes on a bad Hue, which continues till the Pus be evacuated. Theſe Abſceſſes muſt be opened, whenever the Pus can be perceived to fluctuate under the Fingers.

The Swelling very often cannot be appeaſed, till it terminates in the Diſſolution and rotting of the common Membrane, which occaſions thin, ſpreading Suppurations, both under the Skin, and among the Interſtices of the Muſcles. The Fore-Arm is then in a clammy œdematous State; and ſoon after, the thin Suppurations make way for diſcharging themſelves by the Wound: But we muſt, notwithſtanding this, lay theſe Sinuſes open their whole Length, or in part, that we may be able to introduce proper topical Applications upon all theſe Membranes that muſt be thrown off, and thereby aſſiſt Nature in their Separation; and likewiſe that we may be able to cleanſe the Wound.

As the two Bones of the Fore-Arm are covered with Muſcles, which adhere ſo much more firmly, becauſe they have their fixed Attachments in this Place, 'tis poſſible that in the great Confuſion and Diſorder, the Surgeon has not been called in time, to extract all the Splinters. When the Swelling is abated, either without Suppuration, or by ſuch Diſſolution of the Membranes as I have juſt now mentioned, the Surgeon muſt endeavour to take out the Splinter; for the Wound becomes then freſh and ſenſible; and their Points or Edges might occaſion ſuch exquiſite Pain as would bring on convulſive Motions. If the firſt Inciſions have been large enough, and if the Abſceſſes or Sinuſes juſt now mentioned, have been ſufficiently opened, the Extraction of theſe extraneous Bodies will be greatly facilitated.

I ſhall ſay nothing about the Method of Dreſſing theſe Wounds, having amply diſcuſſed that Point in the firſt Part.

Of Wounds in the Wriſt.

GUN-Shot Wounds of the Wriſt are ordinarily accompanied with a Fracture; I mean, that ſome one, or even a number of it's ſmall Bones are curtailed, ground down, or elſe ſhot quite away; and this can never happen but the connecting Ligaments and *Aponeuroſis* of theſe Bones muſt be greatly injured, and the Tendons that paſs over this Part broke or much lacerated.

With regard to the Wound of the Tendons, this Injury may occaſion ſuch Accidents as we ſhall treat of, when we come to Wounds of the *Metacarpus*.

The Inflammation may be kept from ſpreading over the Ligaments and *Capſula* of the Joint betwixt the Wriſt and Fore-Arm, the Diſſolution and rotting of the injured tendinous Parts may be prevented, by the Inciſions and Counter-Openings, the Regimen, the Bleedings and topical Applications which we have recommended in the firſt Part of this Treatiſe.

When theſe Things are judiciouſly obſerved, we often ſee the Wounds of this Part heal up with great Eaſe.

Of *Wounds in the* Metacarpus.

WOUNDS of the *Metacarpus* may be liable to a great many bad Symptoms, as well on account of the Number of Bones which may happen to be fractured, as on account of all the Tendons that paſs over this Part for moving the Fingers. When theſe Tendons are lacerated or bruiſed, they inflame; and their Inflammation is communicated to the Muſcles on the Fore-Arm, and there occaſions a greater or leſs Swelling, or even frequently produces Abſceſſes in their Interſtices.

terſtices. This ſeldom happens, but at the ſame time the annular Ligament, that binds down theſe Tendons at the Wriſt, participates more or leſs in the Swelling.

Theſe Accidents muſt be prevented, if poſſible, by the Means which we have pointed out in the two firſt Parts; and thither I refer the Reader likewiſe for the proper Dreſſings of ſuch Wounds. I ſhall only add with regard to Abſceſſes generated in the Fore-Arm, that if they are not opened betimes, the Pus will run out by the Wound in the Hand, along the Tendons which march thither; and that this Diſcharge of the Pus will render the Abſceſs more tedious of opening, than when the Tumor makes a cloſe Cavity, and thereby confines the Pus. Though there be a Communication betwixt the Abſceſs, which has been opened, and the Wound, we may ordinarly diſpence with joining the two Orifices into one; and we muſt, as much as ever we can, preſerve the annular Ligament without dividing it. We have ſometimes, however, met with Caſes, where it was abſolutely neceſſary to cut this Ligament, becauſe it ſtrangled the Part too much by it's Swelling.

Of Wounds on the Fingers.

A Gun-Shot Wound ſeldom happens to one of the Fingers, except when Part of that Finger is ſhot quite away. Theſe Wounds are frequently attended with Inflammation and Abſceſſes that ſpread over the Hand, and even over the Fore-Arm. Such Accidents muſt be prevented by the Helps which we have recommended elſewhere. The Fingers are ſo uſeful and neceſſary to Man, that we muſt neglect no Means of preſerving them; and ſuppoſe the Wound of a Finger is complicated with a Fracture, we muſt obſerve the ſame Conduct as if it had been the Arm or Thigh, the Bone of which is never broke ſmooth. 'Tis neceſſary in ſome Caſes to perform the Amputation, either at the Articulation with the next ſuperior *Phalanx*, or at the middle of the *Phalanx* itſelf, above the Wound. I ſhall excuſe myſelf from deſcribing the Manner of doing this, and refer to the different Treatiſes of the Operations.

Though the Wounds which may happen to the firſt *Phalanx* of the Thumb, differ from thoſe of the Fingers, becauſe of the thick Muſcles that cover this Part, yet I ſhall paſs them over in Silence: They are of the ſame Nature with all Wounds of Parts where the Bone is ſurrounded by large Muſcles, and require the ſame Treatment from the Surgeon.

Of Wounds in the Thigh.

THE more fleſhy any Limb be, the more Danger there is of ſwelling, after a Gun-Shot that has pierced deep. The Thigh is of this Kind, being covered with very large Muſcles and much Fat, eſpecially at it's ſuperior Part: Wherefore we muſt inflict more liberal Inciſions here, than in another place, eſpecially if the Bone is broken or laid bare. I know that large Wounds are followed by large Suppurations, and that large Suppurations exhauſt the Patients; but I know alſo, that when ample Inciſions are made, the Parts will be much leſs diſturbed in extracting the extraneous Bodies, which will ſpare a great Deal of Pain, and haſten the Cure. The painful Frictions and Lacerations occaſioned in the nervous Syſtem, by ſearching through narrow and ſlanting Paſſages for the extraneous Bodies, will irritate more than the Inciſions which I propoſe, more than the Bullet could do by piercing the ſoft Parts, nay perhaps more than it could by fracturing the Bone. By theſe Inciſions we prevent Congeſtions and Suppurations, that would in the End oblige us to make Inciſions of a much greater Extent.

The tendinous Expanſion or *Aponeuroſis* of the *Faſcia-Lata*, which inveſts a great Part of the Muſcles that compoſe the Thigh, requires particular Care in unbridling and dividing it in all Directions, as is neceſſary when the Wound affects this Membrane: And if this Method be neglected, it may inflame, rot, and be diſſolved.

The crural Artery, as every Body knows, ſends off a great many Branches of a conſiderable Size, to the Muſcles of the Thigh; and it is poſſible we may open ſome of theſe in making the Inciſions. In this Caſe the Hæmorrhage muſt be ſtopt by the Ligature. Beſides, it may ſo happen that ſome of theſe Branches bleed upon the Separation of the Eſchar; wherefore, if from the Situation of the Wound, we are under Apprehenſions of this Accident, we muſt keep a Tourniquet looſely applied above the wounded Part, as I directed in Treating of Wounds in the Arm.

Suppoſing the Trunk of the crural Artery be opened, the Patient will quickly expire, if the Surgeon be not then, or in a very ſhort time preſent, to ſtop the Hæmorrhage with a Tourniquet; after which he ought to make a Ligature upon the Artery, immediately above it's Orifice, were that even where it paſſes over the *Os Pubis*. It is true indeed, after ſuch a Ligature the Thigh muſt mortify, if there be no large enough Branch detached to the Muſcles or neighbouring Parts that can ſupply the Want of the Trunk, which will be known in a few Days: But in the firſt Attack our Buſineſs is only to ſave the Patient from dying in his Blood; and after that, we can next perform the Amputation.

Without ſaying any Thing of the Dreſſings, which have been ſufficiently explained in the firſt Part, I ſhall only obſerve, that, ſuppoſing the *Femur* is broke to Pieces, and there is Reaſon to hope the Thigh may be preſerved, we muſt, after all the Intentions of Art are fulfilled, manage the Affair ſo, that the other remaining Pieces of Bone be kept fixed in their natural Place, and hindered from playing one againſt another, as we have ſaid in ſpeaking of Wounds in the Arm.

Of Wounds in the Leg.

THE Leg, whoſe Muſcles are completely inveſted with a common tendinous Membrane, and fixed along their whole Length to two Bones, is therefore, in the ſame Circumſtances as the Fore-Arm, when wounded by a Shot: And therefore I ſhall ſay nothing concerning it, becauſe I ſhould only repeat the Precepts that I have formerly given with regard to ſuch Sort of Wounds. If the *Tendo Achillis* be completely divided, beſides the Inciſions and other Treatment that may be neceſſary, the Patient's Foot muſt be kept extended with a proper Bandage. By this Means the divided Lips are brought into Contact, which the Bending of the Foot would conſtantly be ſeparating; and if the Patient recovers, Nature will have leſs Trouble in filling up the empty Space, and cicatrizing the Wound. It is even poſſible that the *Cicatrix* which is formed here, may be ſomewhat of a tendinous Nature, being partly generated by the Juice which ouzes out from the Extremities of the *Tendo Achilles*, and conſequently be firm enough to ſupply the Defect of that Tendon. If this Tendon has only been half cut through, the Situation of the Foot when kept in a conſtant State of Extenſion, will give Eaſe to that Portion which is not divided; fewer bad Symptoms will caſt up, the *Cicatrix* will be ſooner formed, and when the Patient is cured, he may have the free Motions of his Foot preſerved.

Of Wounds in the Tarſus.

GUN-Shot Wounds of the *Tarſus* when the Bullet remains in it's Subſtance, or when it has pierced quite through, are much more dangerous than thoſe of the Wriſt: And a great many Reaſons may be given for this. Firſt, the Bones of the *Tarſus* are larger than thoſe of the Wriſt, and conſequently a greater Havock is occaſioned here. Secondly, the tendinous Parts that cover theſe Bones and tie them together, are larger and more numerous. Thus the nervous Syſtem ſuffers more in the Injury. Thirdly, the conjoined Group of Bones in the *Tarſus* forms a much thicker Body, and therefore we cannot reach with our Inciſions to the Bottom of the Wound, as in the ſoft fleſhy Parts. Theſe Wounds ſhould therefore be regarded as being of very great Conſequence, and even I may ſay, of as much Importance as thoſe that pierce a Joint quite through. If the Leg is not amputated, whatever we can do by Way of Prevention, they are ordinarily accompanied with racking Pain, with Swelling and Inflammation, the Companions of the former, with rotting Suppurations, the Conſequence of theſe laſt, and with convulſive Motions of the Limb. We cannot deny that in ſome Inſtances theſe Wounds have been cured without the Amputation; but ſo many Patients have been loſt through a Neglect of this Practice, that there ſeems a neceſſary Inducement of performing the Operation expeditiouſly. Thoſe who have fancied there was no Neceſſity of having immediate Recourſe to this, have probably been deceived by the Swelling that appeared moderate for the firſt few Days: But if one reflects on the Structure of this Part, he will ſoon diſcover that it is not fleſhy enough to allow of a great Increaſe of Bulk under Inflammation; wherefore, he muſt collate the ſlight Swelling that appears, with the tendinous and bony Structure of the Part, and with the Accidents that may naturally be expected, or already ſhow themſelves, in order to judge of the probable Conſequence. If the Swelling of the *Tarſus* is moderate, the Leg ſwells, and this ſhould determine the Surgeon to a ſalutary Deciſion.

We may ſay in general, that theſe Kinds of Wounds require the Amputation of the Member to be undertaken expeditiouſly, if we would have it ſucceed. But, as ſome of the wounded have been cured without the Operation, the Surgeon muſt be directed in his Conduct, by the State of the Patient and Condition of the wounded Part.

If the foreign Body that wounded the *Tarſus*, has not pierced through the Knot of Bones which compoſe this Part from Side to Side, but without penetrating deep into it's Subſtance, has ſhot away ſome Portion of it, and thereby made a large open Wound, that is not covered with the Skin; this Wound may be cured with proper Treatment without Amputation, provided the Joint betwixt the Foot and Leg has not been damaged, nor it's capſular Ligament laid open.

Of Wounds in the Metatarſus.

WOUNDS of the *Metatarſus* are not analogous to thoſe of the *Metacarpus*, becauſe the Sole of the Foot is much thicker than the Palm of the Hand.

What cauſes this Thickneſs, is, that the Bones of the *Metatarſus* are covered on this Side with very thick Muſcles; theſe Muſcles again, with a tendinous Expanſion, ſomewhat in Form reſembling a Gooſe Foot; this Expanſion with a good deal of Fat; and the Fat with a very thick Skin, which is ſtill inveſted with a thick horny Scarf-Skin. Bad Symptoms are therefore ſo much the more to be apprehended, as the Gooſe-Foot Expanſion may ſwell and inflame, and then it will too much confine and ſtrangle the Muſcles and Fat, eſpecially if theſe be likewiſe inlarged by Inflammation. Add to this, that the Skin and Scarf-Skin which are very hard, don't eaſily give way to the Swelling of all theſe encloſed Parts, whence a Mortifiation may quickly enſue, as we have ſaid in the firſt Part, if not induſtriouſly prevented.

Wherefore the Wounds of the *Metatarſus* have this Peculiarity, that the Inciſions which we have recommended in the firſt Part, ſhould be made here with Loſs of Subſtance; I mean, that we muſt remove a Portion of the Skin, and even of the Gooſe-Foot Expanſion; otherwiſe the Inciſions will be almoſt fruitleſs, for the inflamed fatty Subſtance, and even the Bodies of the Muſcles, would puff up ſo luxuriant, as to produce a Kind of *Hernia* at the Wound in Form of a Muſhroom.

Of Wounds in the Toes.

GUN-SHOT Wounds of the Toes are analogous in their Nature and Cure to thoſe of the Fingers; and therefore to avoid an unprofitable Repetition, I ſhall paſs them in Silence.

The End of the fourth Part.

A
TREATISE
OR
REFLECTIONS,
Drawn from PRACTICE on Gun-Shot Wounds.

PART V.

Precepts and Aphoriſms deduced from Experience.

Firſt. IF the proper Inciſions are not made in large Gun-Shot Wounds, they will not heal, or, not without great Difficulty; and they may even continue fiſtulous.

A Gun-Shot Wound, when the foreign Body has pierced ſomewhat deep into the Subſtance of a Limb, ſo far reſembles a *Fiſtula*,

Fiſtula, that the Bottom is wider than the Entrance. And as in curing a *Fiſtula*, we are obliged to make it's Entrance or Orifice much larger than it's Bottom, for the ſame Reaſon, we can have no Expectation of effecting the Cure of ſuch a Gun-Sot Wound as we have ſuppoſed, except we dilate the Entrance ſufficiently to convert the whole Diviſion of Parts into a wide open Wound. This large Aperture in the Entrance of the Wound has great Advantages, as we have formerly ſaid.

The Figure, Length, Breadth and Depth of the Inciſions is to be determined from five Circumſtances. 1. The Depth and Extent of the Contuſion. 2. The Nature of the wounded Parts, whether fleſhy, tendinous, or bony. 3. The Depth of the Wound. 4. The Bulk of the Limb which is large or ſmall, fat or lean. 5. The Number and Size of the extraneous Bodies that muſt be extracted.

Second. In making our Inciſions, we ought, as much as poſſible, to preſerve the Subſtance of the Parts.

When I adviſe, in the Treatment of Gun-Shot Wounds, to make Inciſions proportionable to the Largeneſs of the Contuſion, or Laceration, which the extraneous Body has produced in the Subſtance of any

Limb, ſo far am I from being inconſiſtent with this Rule, which ſeems to be the Dictate of Nature herſelf, that I co-incide with it's Intentions; and it is purely to preſerve the Subſtance of the Part, that I recommend them. I ſpeak of ſuch Inciſions and Scarifications alone, where there is very little, or no Loſs of Subſtance; for I know we cannot ſave the Skin too much *(a)*, as I have demonſtrated in my Obſervations. *Vol.* 1. *Obſerv.* 13, *and* 14. and if I adviſe, in any Caſe, to cut off a Portion of the Eſchar which the Bullet has made, I counſel only to remove the Fleſh that is already dead, in order to advance the Work of Nature, which could not have ſeparated that, without a long Time and Deal of Trouble.

The Inciſions or Scarifications will ſoon re-unite, if by their Means we have prevented or appeaſed all the bad Symptoms: And therefore we may ſay, that by Means of them, we have preſerved the Subſtance of the Part, which a Gangrene perhaps would have deſtroyed. How many Limbs have been ſaved by theſe Inciſions, which otherwiſe muſt unavoidably have been amputated?

(*a*) Manget, Aph. 32.

Third. The Times of Dreſſing which ought to be more or leſs frequent, ſhould be regulated by the different States of the Wound.

By dreſſing a Wound, is underſtood the removing every Thing that had been laid over it, and putting another *Apparatus* or Covering in Place of theſe. This is done on three different Accounts.

1. To perform ſome chirurgical Operation upon the Wound, that is become neceſſary.

2. To diſcharge the Pus of the Wound.

3. To renew, or change the Medicine that has been applied.

There can be no Abuſe committed with regard to the firſt Motive that induces us to take off the Dreſſings; for after an Operation is become neceſſary, it ſhould be executed as ſoon as poſſible: And even when the Wound has been dreſſed but a few Hours before, the Dreſſings muſt be removed and give way to the Operation. The Diſorder may increaſe by delaying the Operation twenty four Hours: Thus there will be as much Harm in a Delay, under Pretence that the Wound is newly dreſſed, as there would have been in executing it before it is neceſſary (*a*).

(*a*) Manget, Aph. 45.

The ſecond Motive that induces to dreſs a Wound, is to diſcharge the Pus, and this muſt be regulated by it's Quality or Quantity. The Quality of the Pus may be noxious from a great many Cauſes, as we have formerly obſerved; and when the Eſchars are fallen, that vitiated Pus may irritate the nervous *Papillæ*, which ſometimes occaſions Pain in theſe Wounds. Wherefore in this Caſe we muſt dreſs every Day, and ſometimes every twelve Hours, even when the Quantity of Pus is not exceſſive. The Quantity of Pus is another Reaſon for dreſſing, when there is as much as wets through every Thing that has been put on the Wound; but if it ouzes not thus through, and if the Suppuration is gentle, as when the Wound ſhews a Tendency to re-unite, we muſt dreſs at conſiderable Intervals, that is, once in twenty four Hours, and ſometimes only once even in two or three Days: In theſe Circumſtances we dreſs ſeldom, to hinder the external Air from getting into Contact with the Surface of the Wound, and vitiating what little Pus there is for keeping it moiſt, which we ought to regard as a healing Balſam *(a)*, and likewiſe to avoid diſturbing the fleſhy Granulations by Friction.

(a) Manget, de Vuln. Aph. 6.

Laſt of all, the Neceſſity of renewing or changing the medicinal Application, is a third Reaſon for dreſſing a Wound. Medicines are either ſuppurative and Promoters of Diſſolution, ſpirituous, vulnerary and drying, or eſcharotick. The Suppuratives and the Promoters of Diſſolution are, and indeed ought to be uſed, only before the Separation of the Eſchars, and when the Plentitude of all the little Veſſels, in the Circumference of the Wound, has not yet ſubſided.

Suppoſing the Eſchar to be ſuperficial, it's remaining in the Wound can do no Harm, and, we need not dreſs till two Days after: During that Interval it will ſeparate, and when we remove the Dreſſings, we are almoſt ſure of finding a Suppuration upon the Wound. But ſuppoſing the Eſchar is thick, that putrid Subſtance lays us under a Neceſſity of dreſſing every twenty four Hours, not ſo much to renew the medicinal Application, as to ſend off the putrid Steam which the Eſchar raiſes in the Wound. When this falls, the Quality or Quantity of Pus will regulate the Frequency of Dreſſing. If the Circumſtances of any Caſe require the Uſe of ſpirituous Applications to prevent a Gangrene which threatens the Part, the Condition of the Wound craves dreſſing twice a Day;

both to diſcharge the cadaverous Steam and putrid Seroſities that wet and taint all the Dreſſings, and to renew the Medicine. If we are uſing vulnerary and drying Medicines, when the Wound wants only to be cloſed over, the Dreſſing muſt not be repeated oftener than once in two Days (a); if the Quantity of Pus is not too conſiderable, or if it does not grow acrid in the Wound, and occaſion troubleſom Itchings there. If we are obliged to make Uſe of ſome Eſcharotick, the Nature of the Medicine muſt determine the proper Time of removing that Dreſſing; becauſe theſe Applications work the propoſed Effect ſooner or later according to their Activity.

Fourth. The frequent Introduction of a Probe or Fingers into a Wound, may occaſion many bad Symptoms (b).

Any Irritation of the nervous Syſtem is ſo ready to diſturb the Œconomy of our Machine, that the great Creator has taken Care to cover the Extremities of the Nerves that terminate in the Skin, with a Scarf-Skin, which is extremely fit to defend them againſt any hard Friction: And we may even obſerve that this Scarf-Skin, thickens and grows harder on the Feet and Hands of thoſe who walk bare footed, or employ their Hands much in laborious Work. Nature is as induſtrious in repairing the ſoft Parts, as ſhe has been in forming them; for when the Eſchar, whether it be deep or ſuperficial, that inveſted the Inſide of a Wound, is ſeparated, all the nervous *Papillæ* of that Surface are expoſed naked, and conſequently beſtow an exquiſite Senſation, but in a few Days, they are covered over with fleſhy Granulations that are much leſs ſenſible. Let us learn from this, to pay great Regard to the nervous Syſtem. If we excite frequent or continued Frictions in a Wound, by introducing a Probe or Finger, we muſt neceſſarily touch the Surface, before the fleſhy Granulations are conſtituted; or when theſe Granulations are formed, we will make them bleed, deſtroy their tender Subſtance, and thereby touch the naked Extremities of the Nerves. By this Means we excite a Kind of criſp Tenſion, not only in the nervous Syſtem of the Part, but alſo in that of the whole Body. Add to this, that the Patient cannot endure his Wound to be ſearched, without a Kind of Horror, and even a Trembling, which gathers Violence in Proportion to the Degree of Scrutiny. If all this does not occaſion ſudden and capital Accidents, as ſometimes happens, it retards the Suppuration at leaſt, by choaking the ſmall Veſſels that ſhould furniſh the Matter. Then, this purulent Matter is admitted into the Stream of the Circulation; where it taints the Fluids, diſturbs the inteſtine Motion which Nature has imprinted on them, and which is the Characteriſtick of living Fluids, and at laſt becomes the Cauſe of Death.

(a) Manget., Aph. 34. (b) Manget de Vul. Aph. 35.

Long and frequent probing of Wounds is therefore a very pernicious Practice; and if the Surgeon has made proper Inciſions at firſt, ſuch as I have propoſed, he ſhould never ſearch again, without ſome urgent Neceſſity. When Nature is left to her own Tranquillity, ſhe will guide out the extraneous Bodies, if they have not been extracted the firſt Day; and it would be difficult to lay hold of them, without haraſſing the Sides of the Wound.

What I have ſaid here of inconſiderate Probing, illuſtrates the proper Method of Dreſſing, which ought to be very gentle, almoſt in every Caſe. The Confines of the Wound ſhould be wiped, and frequently even waſhed clean, when the Medicine or Pus hardens there. It is alſo convenient to abſorb the Pool of Matter in the Bottom, with a little dry Lint, but the Sides or Surface of the Wound ſhould never be wiped. For, beſides that this cannot be done without running the Riſk of making it bleed, the Pus which keeps that Surface moiſt guards it from being in too immediate Contact with the Lint or medicinal Application; and that ſmall Quantity of Pus can have no Effect in preventing the Operation of ſuch Medicines as are ſpread upon the Lint.

Fifth. If, in Dreſſing, we obſerve a Clod or Rope of Blood, at the Edge of a deep Wound which we had not been allowed to dilate ſufficiently, it muſt not be taken out.

That Clod, or that Rope of Blood, is a Proof that ſome Veſſel is certainly opened; and the Blood has ceaſed to drivel forth, becauſe the Clod which was firſt generated near the Aperture of that Veſſel, and afterwards gradually lengthened itſelf to where we ſee it, has at laſt cloſely blocked up that Orifice. It officiates therefore as a Plug, and ſupplies the Place of a Ligature; it is for this Reaſon we leave it, and even, as much as we poſſibly can, avoid diſturbing it. If it be in the leaſt pulled, the Plug is looſened in ſome Point of it's Adherence with the Veſſel, and a gentle Dropping of Blood enſues. If we remove it quite, we thereby draw out the Plug, and the Blood ſtreams freely enough to require being ſtayed anew, by ſome of the forementioned artificial Means. As this Veſſel lyes at a great Diſtance, (for I have ſuppoſed the Wound deep and narrow, becauſe it has not been practicable to dilate it enough) we muſt fill up the Wound again with dry Lint, or introduce ſome ſtiptick Application, which is equally prejudicial to the Well-being of the Part, and to the Suppuration which it muſt either retard or ſuppreſs. What I have formerly ſaid of the various Hæmorrhages and bleeding Wounds, is applicable only to Caſes where the Wound is ſufficiently inlarged, and where we have the Command of making a Ligature.

Sixth. The Worms that ſometimes generate in Wounds, indicate no Evil.

It is not ſtrange to meet with Worms in Gun-Shot Wounds, and we have frequently ſeen them breed likewiſe in other Wounds. There is no Probability that ſuch Worms proceed from the Blood; I dare not however poſitively deny it. It is more probable, in the Time of Dreſſing, when the Wound is expoſed to the open Air, or when it is not cloſe coverd, that ſome of the Inſects that are conſtantly friſking about in the Air, depoſite their Eggs there, and that the Pus of the Wound ſerves as a Bed for hatching them.

The Breeding of theſe Worms ought to give us no Anxiety with regard to the Succeſs of the Caſe; for Experience teaches us that they never appear in unkindly Suppurations, or gangrenous Diſpoſitions, but only in laudable Suppurations, or a complete *Sphacelus*.

All the Inconvenience therefore which attends theſe Worms, when the Wound is in a good Condition, is, that when they grow large they may irritate by their gnawing, which may give the Patient very uneaſy Twitchings.

After having removed them therefore, we muſt prevent the Generation of a ſecond Progeny, by introducing Bitters into the Wound, ſuch as Powder of Myrrh or Aloes, the Infuſion of Wormwood, or any Thing of that Nature, which ſhould be mixed with the Medicine that the other Circumſtances of the Caſe require.

Seventh. When a wounded Perſon feels a Pulſation in the diſeaſed Limb, the Wound is threatned with a Hæmorrhage, Inflammation and Gangrene.

The Pulſation of Arteries, every Perſon knows, is a beating that is natural to them; but then, it is not commonly perceivable to us, except when we apply our Finger directly upon the Body of the Artery.

Whence does it happen therefore that a Patient ſometimes feels a general throbbing, or a beating of all the Arteries in the wounded Member? Undoubtedly it proceeds from the great Tenſion in that Part; for the Laws of Motion teach us, that the ſmalleſt Agitation communicates itſelf to all the Parts of a hard tenſe Body. It is this Tenſion which threatns the Hæmorrhage, Inflammation and Gangrene. The general Tenſion locks up the Circulation; and the Blood meets with greater Obſtacles in returning by the Veins towards the Center, than in marching out along the Arteries; thus the Blood is accumulated in the Veſſels, and theſe being ſurcharged, ſome of them may burſt, whence a Hæmorrhage enſues. The ſame Tenſion which impedes the Circulation of the Blood, and eſpecially it's Return towards the Center, threatens alſo a Mortification of the Part, ſince the Life of any Part depends on the free Courſe of Circulation. I have ſpoke in another Place, of the Remedies which we muſt have Recourſe to in this Caſe, ſuch as Bleeding, *&c.*

If a Hæmorrhage enſues that is not very conſiderable, it may ſometimes effect a ſalutary Derivation, that ſhall evacuate the Fulneſs of the Part, or at leaſt ſuſpend the Progreſs of the Mortification.

Eighth. When a Part that has been ſwelled ſeveral Days, in conſequence of a Gun-Shot Wound, ſubſides to it's natural Size in the Interval between two Dreſſings, without any Mitigation of the Fever, it is a Sign of ſome lurking Conflict.

We have ſeen that the Swelling enſued and continued in conſequence of the Inflammation, and of the Load of the ſurcharged or extravaſated Fluids; it were to be wiſhed theſe could diſcharge themſelves compleatly by the Mouths of ſuch Veſſels as open into the Wound; but this does not always happen. In moſt Caſes the greateſt Part takes this Rout; and only a very ſmall Quantity is abſorbed, which occaſions what we call the Fever of the Suppuration. In this Caſe the Swelling of the Part falls gradually. But from whatever Cauſe it be, if the whole Quantity of Fluids is ſuddenly abſorbed, in the ſhort Space of Time between two Dreſſings, we find the Wound almoſt dry, and the Limb reduced nearly to it's natural Size. Then theſe Fluids which have not yet acquired their laſt Degree of Virulence, continue to ferment in the Maſs of Blood. This is what gives the Patient theſe irregular Shiverings, ſucceeded by a ſharp Fever, and attended with clammy Sweats; which

Symptoms at length terminate in the Patient's Death. See my *Chirurg. Obſerv. Vol. II. Obſ.* 69.

There is no Impoſſibility in ſuppoſing that the Quality of the Fluids, which are vitiated with ſome noxious Taint that we have not taken ſufficient Care to evacuate at firſt, may be the Cauſe of this Reflux; but the Surgeon may likewiſe have ſome Share in that Cauſe, either if he has omitted any neceſſary Circumſtance in the Method of Cure, or if he has irritated the Wound by frequent and unadviſed Probing, or laſtly, if he has uſed improper topical Applications.

Ninth. When the Surgeon foreſees an indiſpenſable Neceſſity of having Recourſe to the Amputation of the Limb, after a Gun-Shot Wound, he ſhould never delay the Operation.

The Amputation may be ſo viſibly urgent, if it be not put in Execution the Patient muſt die ſoon. It is not with relation to ſuch a Caſe that I lay down this Axiom. But the Diſeaſe may ſtill be free of theſe capital Symptoms that threaten a near impending Death; and the Amputation, though viſibly neceſſary, ſeem to admit of a Delay for ſome Days. This is the Caſe where Opinions ſometimes differ with regard to the proper Time for amputating; though in reality there is no Room to heſitate.

What may deceive in this Point, and induce one to poſtpone the Operation a few Days, is 1. The Hope, and earneſt Deſire of ſaving a Limb. 2. Becauſe we obſerve ſuch Patients as are weak, and in ſome Meaſure exhauſted, recover better after an Amputation, than ſuch as are ſtrong and of a full Habit. With regard to the firſt of theſe Motives, it can never impoſe upon good Practitioners, who know by a ſingle Look, if a Wound can be cured without the Amputation, or if it cannot (*a*). The ſecond Inducement to delay the Operation, is as ill founded as the former; 'tis true, Weakneſs is advantageous to the Patient, when it is not owing to a Depravation of his Fluids; but if theſe have been vitiated by Pain, Loſs of Sleep, Fever, and the other Symptoms that neceſſarily attend every Wound which requires Amputation of the Limb, the Weakneſs in this Caſe is an additional bad Symptom, and not a favourble Circumſtance that will concur to the Succeſs of the Operation. We muſt therefore amputate ſpeedily, to hinder the Fluids from being tainted. This

---

(*a*) Manget, de Vuln. Aph. 19.

Corruption or Taint of the Fluids is the more to be dreaded, becauſe notwithſtanding the Plenitude of the wounded Part, a Communication is ſtill kept up betwixt that Part and the reſt of the Body, as we have formerly ſaid.

We may, and even ought to bring on ſuch a degree of Weakneſs, as is conducive to the Cure, by a reſtricted Diet, by bleeding proportionably to the Patient's Strength and Habit of Body, and by Evacuations, ſuch as Emeticks and Laxatives given at proper times.

By this Method, the laudable Quality of the Fluids may ſecond the ſalutary Interpoſition of Art.

Tenth. The Reſtleſsneſs and Inquietude that ſometimes attends large Wounds, without any known Cauſe of ſuch a Diſorder, indicate Death.

This Aphoriſm is founded on Experience. We can explain it only by Reaſons that come not up to a full Demonſtration, and conſequently that may be redargued at Pleaſure. However we may find the Reaſon of it in the Explication of the following Aphoriſm.

Eleventh. The inextinguiſhable, burning Drought which we obſerve ſometime happens to Patients after Gun-Shot Wounds, indicates Death.

That Drought, which is almoſt always accompanied with Coldneſs in the Extremities, is a Conſequence and Indication of prodigious Tenſion in the whole nervous Syſtem. That Tenſion or Criſpature, which is a kind of tonick Convulſion, choaks up all the little Veſſels, as we have formerly ſaid. True indeed, the Circulation is carried ſtill on with Freedom in all the Trunks and larger Branches; but it is ſuſpended in all the capillary Subdiviſions of theſe, as well in the Trunk of the Body as in the Extremities, which is demonſtrated by the freezing Coldneſs that is perceivable there. What Cauſe of Wonder have we then, if the Glands of the Stomach, thoſe of the *Oeſophagus*, and all thoſe which ſerve to moiſten the Mouth, are inactive and no longer ſecrete the *Saliva* that ſhould lubricate all theſe Parts?

The violent and ſcorching Thirſt which is only a Symptom in this Caſe, is at the ſame time a Proof of the tonick Convulſion of the whole nervous Syſtem, and of an univerſal diſturbance in the animal Œconomy. As this Diſturbance is greater than the Power of Art can redreſs, we may look upon the Thirſt, which is a Symptom of that, as a mortal Indication.

Twelfth. The convulſive and palpitating Pulſe in a Gun-Shot Patient, prognoſticates Death.

The convulſive Motions obſervable in the Limbs, of which we have treated above, are occaſioned only by a Confuſion and Irregularity in the Motion of the animal Spirits. But when the Pulſe is convulſive and palpitates, it happens from the Scarcity or abſolute Want of theſe Spirits, or from their Adulteration: For the Motion of the Artery is relative to that of the Heart; and it palpitates only in Proportion to the Palpitation of that *Viſcus:* But this Diſorder ariſes in the Heart through a Deficiency of animal Spirits, which ceaſe to flow with their uſual Tides: And as it is the firſt Mover of all the Fluids, the whole Machine muſt go to Wreck, ſo ſoon as it deſerts it's Office.

Thirteenth. I believe I cannot make a better Concluſion to this Treatiſe, than by pointing out to young Surgeons, for whoſe ſake I write, the proper Method whereby they may acquire Inſtruction in the Practice of the Rules I have laid down; for, Practice and Theory are both equally eſſential in a good Surgeon; and either of theſe without the other, is but a poor Acquiſition.

The Students of Surgery may eaſily become Maſters of the whole Theory; publick or private Lectures, Reading of good Authors, Reflection, all conſpire to finiſh them in this reſpect. But the Practice is learnt with great Difficulty, and requires ſome Length of Time: For, it is not enough to attend the great Maſters of this Art, and to ſee them practiſe: One muſt turn Operator himſelf, in order to arrive at a Habit and Dexterity, which is the diſtinguiſhing Character of a Surgeon. And conſidering that Gun-Shot Wounds vary in a thouſand Circumſtances, as we have obſerved above, a young Surgeon cannot ſee too many of theſe Caſes, nor can he be too well habituated in performing the Operations which they may require.

We have been taught Anatomy, and the Manner of performing the capital Operations in Surgery, upon dead Subjects. We learn a Habit upon dead Bodies, of operating with Eaſe, Courage and requiſite Circumſpection. We may as well be inſtructed upon dead Bodies, in the Method of operating in all the poſſible Variety of Gun-Shot Wounds. A Piſtol or Muſket diſcharged againſt the Thigh of a dead Subject, produces a Wound there, of the ſame Nature with a freſh Wound made by the ſame Cauſe, upon that Part of a living

Body. The S[illegible]geon may therefore practiſe h[illegible] this Injury, and obſerve his In[illegible] Precautions, juſt as well as on a [illegible]d Perſon. But in working thus upo[illegible] Dead, he has an Advantage which he [illegible]ot reap from the Living; I mean, afte[illegible] has made all the Inciſions that he thin[illegible]eceſſary, and extracted all the extraneo[illegible]odies or Splinters which he could find, [illegible] may diſſect the Part that he has been wo[illegible]g upon, and ſee if he has done every t[illegible] that he ought, or if he has done too m[illegible]h.

Undoubtedly thi[illegible]ethod often repeated, now upon one [illegible]rt, and then upon another, may inſtr[illegible] prodigiouſly; and therefore I recommen[illegible]t to all young Surgeons who are in Hoſ[illegible]ls, and have Opportunities of following [illegible] By this Means, they will acquire a grea[illegible]eal of Addreſs; by this Means, they wi[illegible]orm juſt Ideas, of the various Diſorders t[illegible] a Bullet may occaſion in this or that [illegible] and theſe Wounds being no longer [illegible]ge or new to them, if we may ſay ſo[illegible]ey will be enabled to go through the w[illegible]e Proceſs, upon every Occaſion, with R[illegible]neſs.

FINIS.